HCal TMax Calibration Quality Checks
GMn, Prior to Pass 2

Sebastian Seeds*

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Contents

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1 How to Read this Document

This document details the timing calibration results for the above experiment, configuration, and replay pass. For information regarding the calibration process, see the overleaf.

Each kinematic has been calibrated separately for timing and the database will reflect this moving forward. All time vs energy plots used for this calibration are generated using updated ADC gain parameters and timing offsets for accuracy.

Each of the sections contains a brief description of the calibration results that follow. Any and all questions/concerns regarding these plots should be directed to the author at the email provided.

2 Special Considerations

- The tmax calibration gives a maximum ADC time difference between the primary cluster block and each additional block for the additional block to be included in the cluster. The database variable is sbs.hcal.tmax

- The following plots are of the minimum magnitude ADC time difference between the primary cluster, primary block and each additional block in the primary cluster (tdiff_blk) after global cuts and active area cuts.

- All of the following plots are after alignments on five runs within each kinematic. For details on the offset calibrations see overleaf.

- The distribution is not symmetric about zero indicating that it is more likely that additional blocks in the cluster arrive later than the primary block (as expected).

- Figure 1 gives the difference between zero and half maximum of the fit to this distribution. The tmax parameter included in the database is four times this number in order to capture nearly 100% of the signal.

- In principle, two parameters could be passed (one for each sign of tdiff_blk) to improve this calibration on future passes which might account for the asymmetric nature of this distribution.

Kinematic	4*tdiff_blk (ns)
4	7.53
7	6.88
11	6.94
14	8.98
8	7.72
9	7.66

Figure 1: tdiff_blk (ns)

3 Primary Cluster ADCt Block Difference, All Channels, Best Time
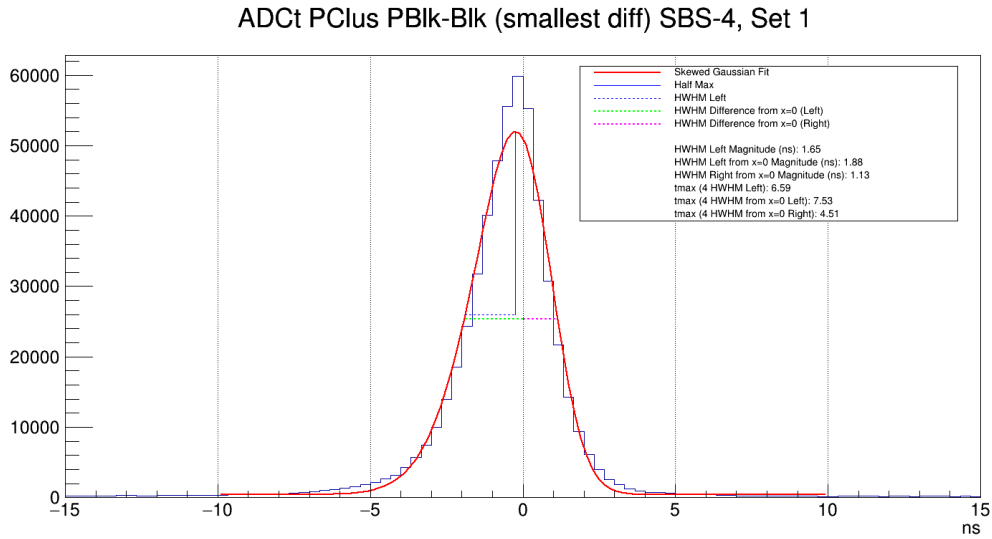
3.a SBS-4

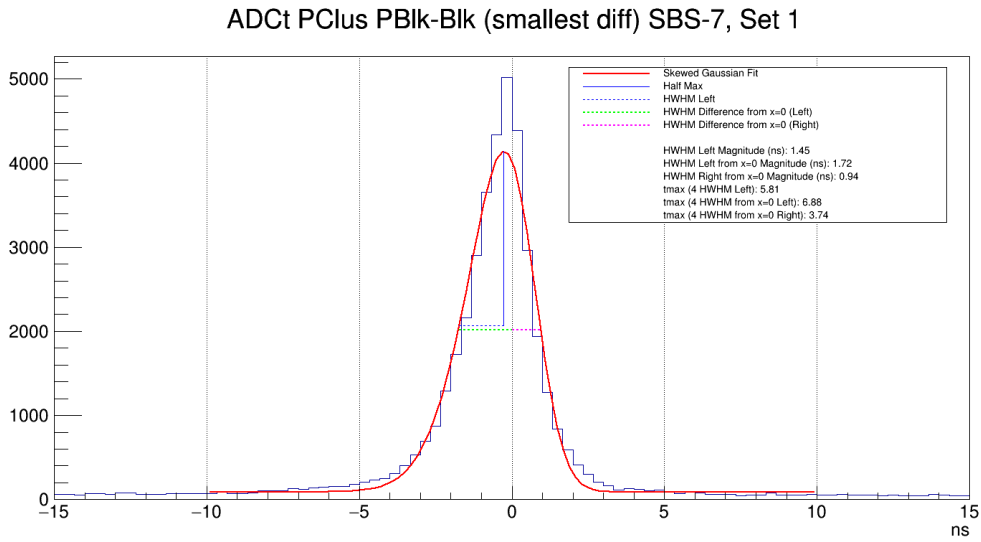Figure 2: ADCt block diff best time post-alignment (ns)

3.b   SBS-7

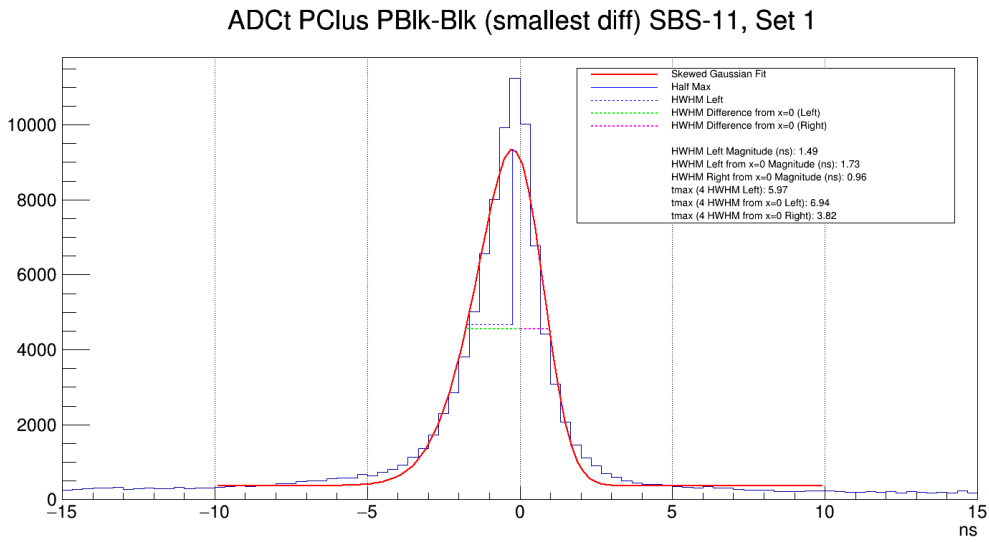Figure 3: ADCt block diff best time post-alignment (ns)

3.c   SBS-11

Figure 4: ADCt block diff best time post-alignment (ns)
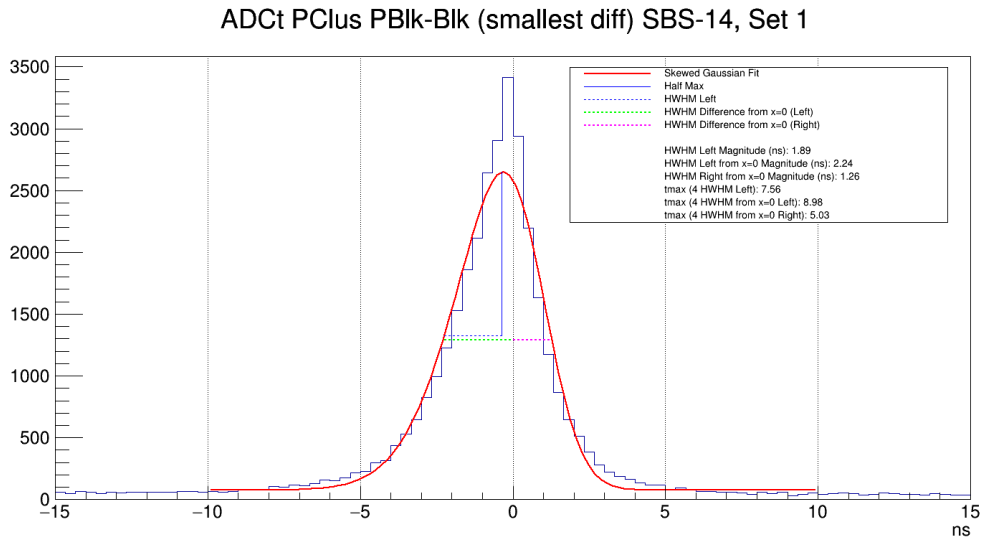
4

3.d   SBS-14

Figure 5: ADCt block diff best time post-alignment (ns)
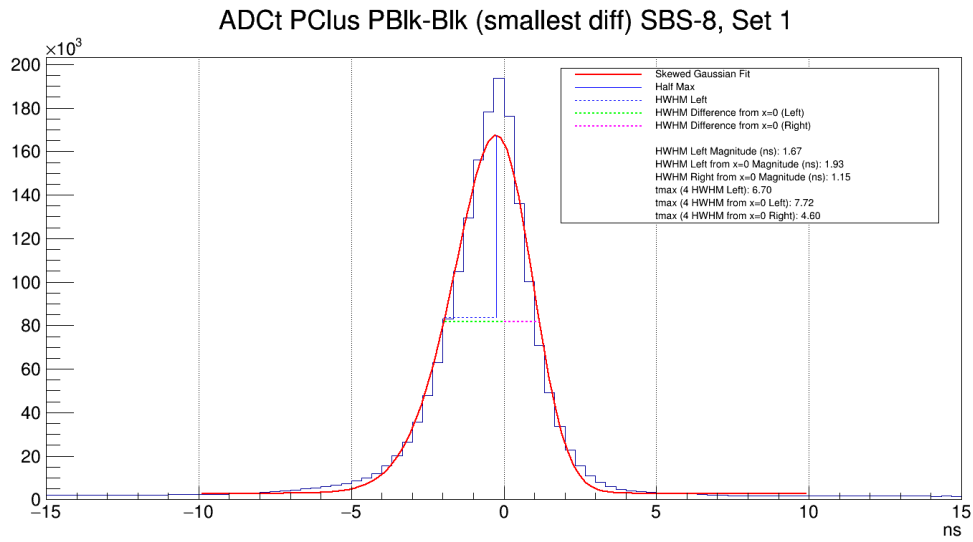
3.e   SBS-8

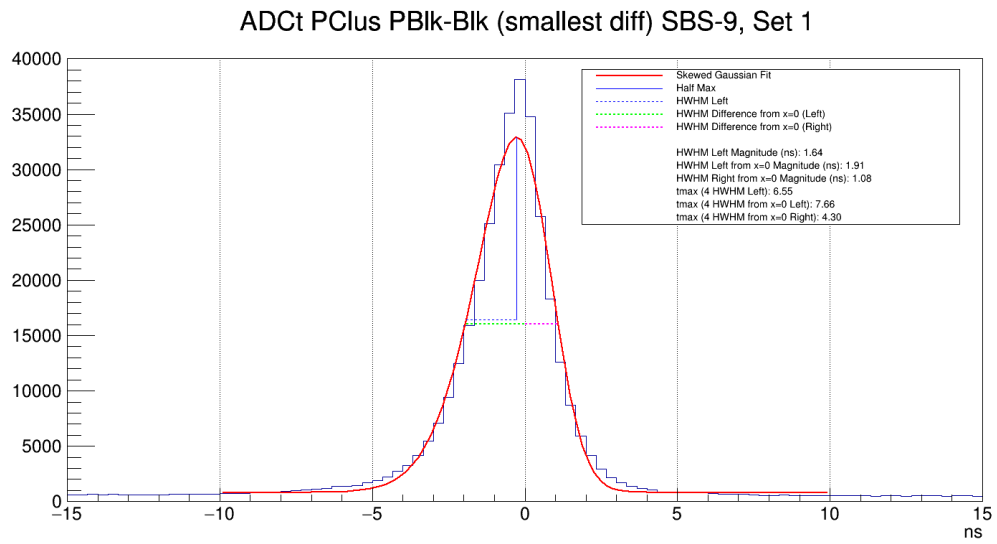Figure 6: ADCt block diff best time post-alignment (ns)

3.f   SBS-9

Figure 7: ADCt block diff best time post-alignment (ns)

4 Primary Cluster ADCt Block Difference, All Channels, All Blocks
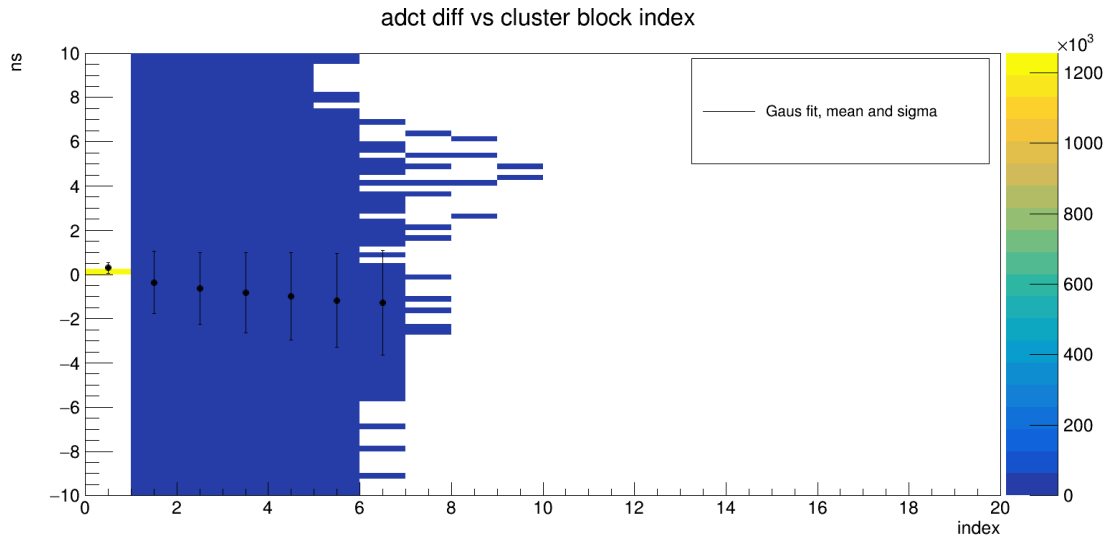
4.a SBS-4

Figure 8: ADCt block diff all blocks post-alignment (ns)
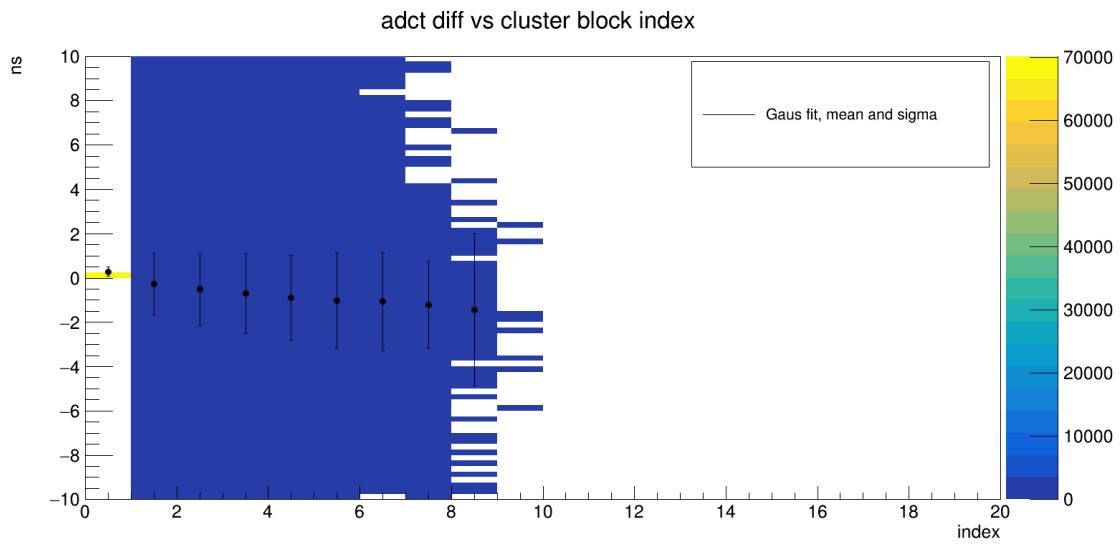
4.b SBS-7

Figure 9: ADCt block diff all blocks post-alignment (ns)
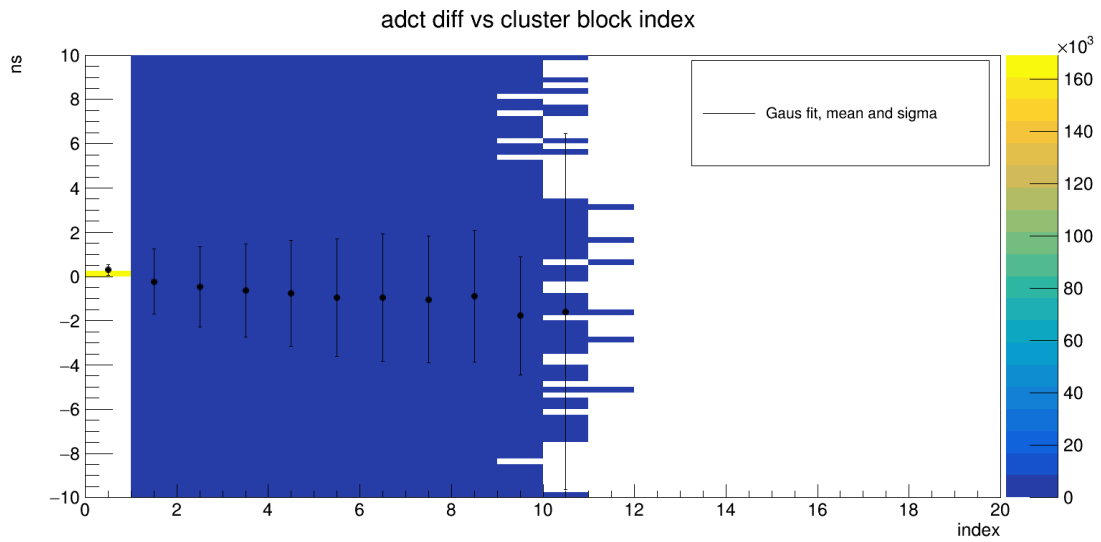
4.c SBS-11

Figure 10: ADCt block diff all blocks post-alignment (ns)
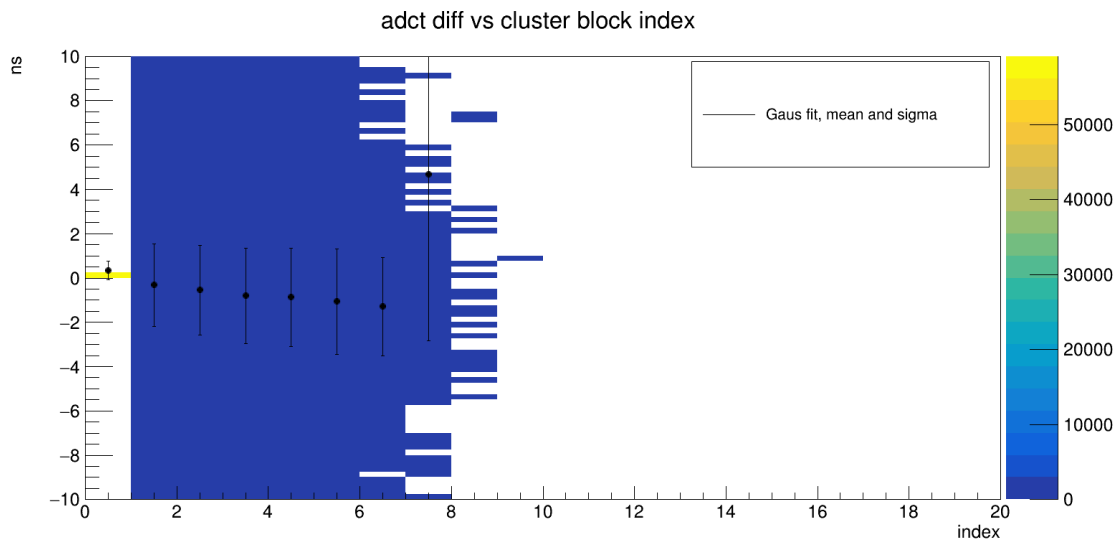
4.d   SBS-14

Figure 11: ADCt block diff all blocks post-alignment (ns)

4.e   SBS-8
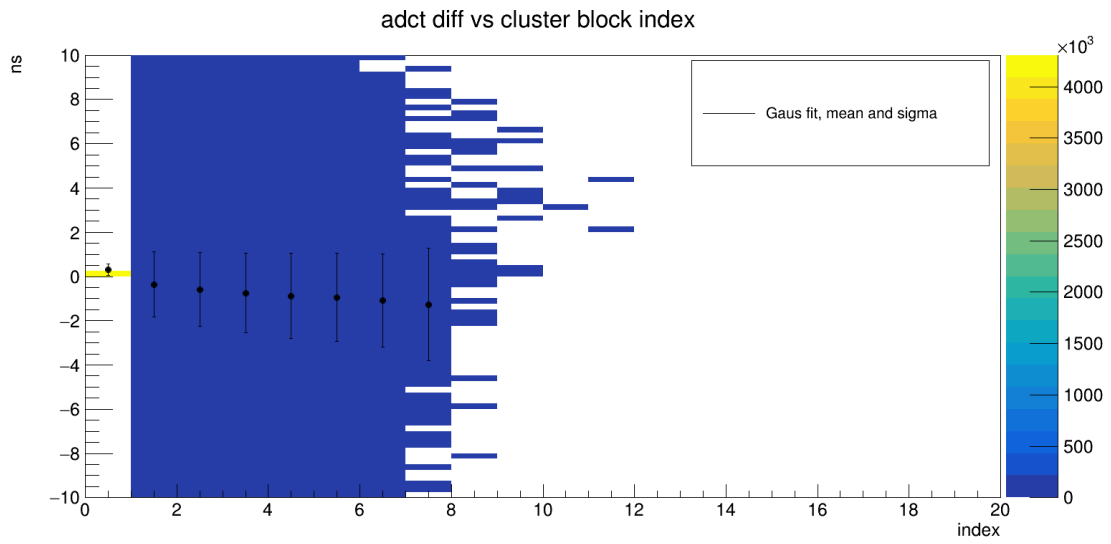
Figure 12: ADCt block diff all blocks post-alignment (ns)

4.f   SBS-9
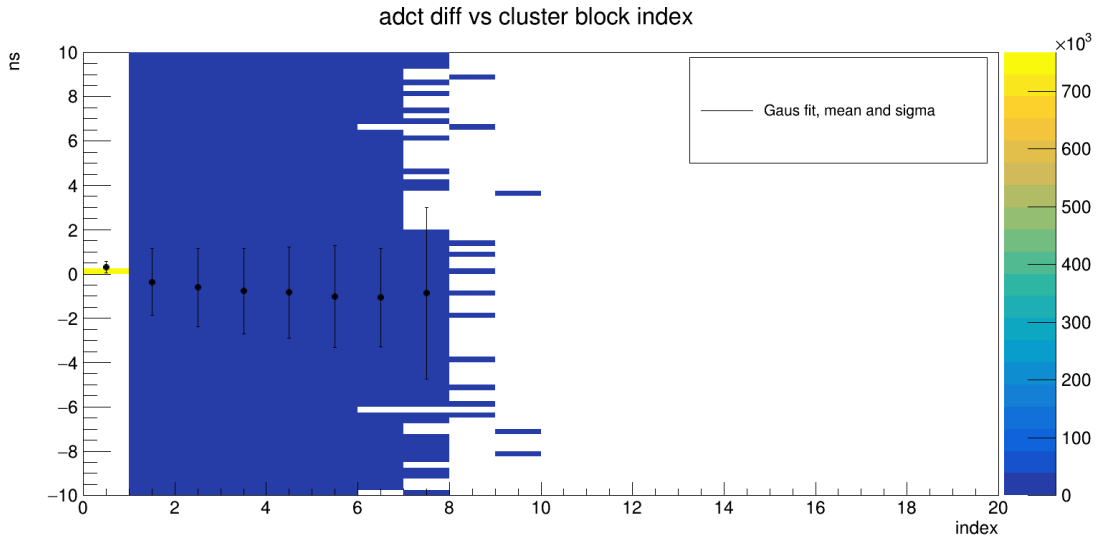
Figure 13: ADCt block diff all blocks post-alignment (ns)

5   Supplemental

5.a   SBS-4

General HCal Timing Calibration Info
Experiment: gmn, Configuration: 4, Pass: 0
Creation Date: 8_27_2023
Target(s) Used: All Available
Calibration Set: --------[2021-10-21 00:00:00]

Elastic Cuts
Global Elastic Cuts: bb.tr.n==1&&bb.ps.e>0.2&&abs(bb.tr.vz[0])<0.08&&bb.gem.track.nhits>3&&abs(bb.etot_over_p-0.92)<0.2&&sbs.hcal.e>0.01&&bb.ps.e+bb.sh.e>1.7

Other Cuts/Information
Minimum Ev per Cell : 50.0
HCal Active Area (Projected Nucleon 1 row/col Within HCal Acceptance)

Figure 14: SBS-4 adct timing cuts and experimental parameters.

5.b SBS-7

General HCal Timing Calibration Info
Experiment: gmn, Configuration: 7, Pass: 0
Creation Date: 8_27_2023
Target(s) Used: All Available
Calibration Set: --------[2021-11-13 00:00:00]

Elastic Cuts
Global Elastic Cuts: bb.tr.n>0&&abs(bb.tr.vz[0])<0.08&&bb.gem.track.nhits>2&&bb.tr.p[0]>2.0&&sbs.hcal.e>0.03&&bb.ps.e>0.2

Other Cuts/Information
Minimum Ev per Cell : 50.0
HCal Active Area (Projected Nucleon 1 row/col Within HCal Acceptance)

Figure 15: SBS-7 adct timing cuts and experimental parameters.

5.c SBS-11

General HCal Timing Calibration Info
Experiment: gmn, Configuration: 11, Pass: 1
Creation Date: 8_27_2023
Target(s) Used: All Available
Calibration Set: --------[2021-11-25 00:00:00]

Elastic Cuts
Global Elastic Cuts: bb.tr.n>0&&abs(bb.tr.vz[0])<0.08&&bb.gem.track.nhits>2&&bb.tr.p[0]>2.0&&sbs.hcal.e>0.03&&bb.ps.e>0.2

Other Cuts/Information
Minimum Ev per Cell : 50.0
HCal Active Area (Projected Nucleon 1 row/col Within HCal Acceptance)

Figure 16: SBS-11 adct timing cuts and experimental parameters.

5.d SBS-14

General HCal Timing Calibration Info
Experiment: gmn, Configuration: 14, Pass: 1
Creation Date: 8_27_2023
Target(s) Used: All Available
Calibration Set: --------[2022-01-12 00:00:00]

Elastic Cuts
Global Elastic Cuts: bb.tr.n>0&&abs(bb.tr.vz[0])<0.08&&bb.gem.track.nhits>2&&bb.tr.p[0]>1.6&&sbs.hcal.e>0.03&&bb.ps.e>0.2

Other Cuts/Information
Minimum Ev per Cell : 50.0
HCal Active Area (Projected Nucleon 1 row/col Within HCal Acceptance)

Figure 17: SBS-14 adct timing cuts and experimental parameters.

5.e   SBS-8

General HCal Timing Calibration Info
Experiment: gmn, Configuration: 8, Pass: 1
Creation Date: 8_27_2023
Target(s) Used: All Available
Calibration Set: --------[2022-01-22 00:00:00]

Elastic Cuts
Global Elastic Cuts: bb.tr.n==1&&bb.ps.e>0.2&&abs(bb.tr.vz[0])<0.08&&bb.gem.track.nhits>3&&sbs.hcal.e>0.03&&abs(bb.tr.tg_th[0])<0.15&&abs(bb.tr.tg_ph[0])<0.3

Other Cuts/Information
Minimum Ev per Cell : 50.0
HCal Active Area (Projected Nucleon 1 row/col Within HCal Acceptance)

Figure 18: SBS-8 adct timing cuts and experimental parameters.

5.f   SBS-9

General HCal Timing Calibration Info
Experiment: gmn, Configuration: 9, Pass: 1
Creation Date: 8_27_2023
Target(s) Used: All Available
Calibration Set: --------[2022-02-02 00:00:00]

Elastic Cuts
Global Elastic Cuts: bb.tr.n==1&&bb.ps.e>0.2&&abs(bb.tr.vz[0])<0.08&&bb.gem.track.nhits>3&&sbs.hcal.e>0.03&&abs(bb.tr.tg_th[0])<0.15&&abs(bb.tr.tg_ph[0])<0.3

Other Cuts/Information
Minimum Ev per Cell : 50.0
HCal Active Area (Projected Nucleon 1 row/col Within HCal Acceptance)

Figure 19: SBS-9 adct timing cuts and experimental parameters.