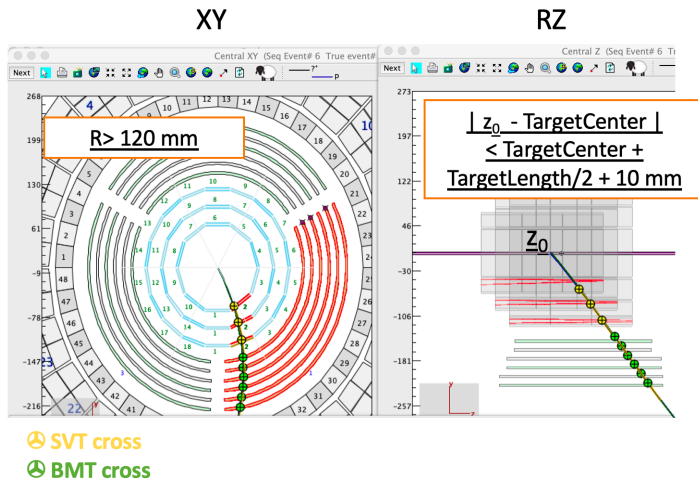


CVT Reconstruction Notes

CVT New Tracking Algorithms:

- SVT Linker Algorithm
 - Starts with finding a line obtained from BMT C detector crosses (RZ Linker); RZ fit gives helix dip-angle line ($z_0 =$ intercept with z-axis)
 - Match line to SVT cross cluster lines (XY Linker) to start arc seed using matched SVT and use Arc finding algorithm to match other crosses providing XY information
 - Pattern recognition cuts:



CVT tracking algorithms seed selection cuts:

- Helix radius $R > 120 \text{ mm}$
 - Minimum to reach CTOF to get PID
- Cut on helix z_0 w/in $\pm 10 \text{ mm}$ of target length
 - Reduces combinatorials
 - Most tracks production vertex in that range

- Clusters ON Track Recovery Algorithm
 - Find missing clusters on track using KF trajectory and refit the track to improve resolution
- Improved SVT-Standalone algorithm
 - Works on SVT only crosses or on SVT+BMT tracks that do not have at least 2 BMT-C crosses
 - Method to find BMT-Z crosses in same angular range as seed arc for matching
 - Selection for SVT crosses consistent with helix

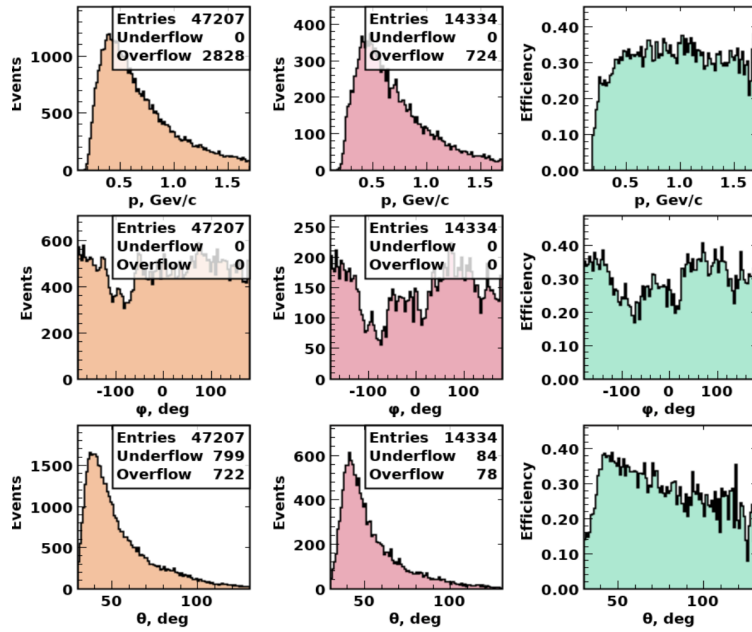
- Require min 2 SVT crosses + 1 BMT-Z cross or 3 SVT crosses
- Track Recovery algorithm for seeds with failed Kalman Fit
 - Uses the seed trajectory to find missed clusters on track and attempts to refit the track with these added measurements
 - If the KF fit still fails, output the seed to track (run KF without filtering or smoothing) and set the status of the track to negative

- Fix of Overlap remover to handle tracks that are closed to each other and share multiple hits

The validation plots comparing the results from tag 8.3.0 to the results obtained from this code are shown on the next pages. The 8.3.0 results correspond to the plots on the left of the figures, and the results from this code, to the plots on the right.

Coatjava 8.3.0

RG-B 5 nA 6371, RGB BG 50 nA

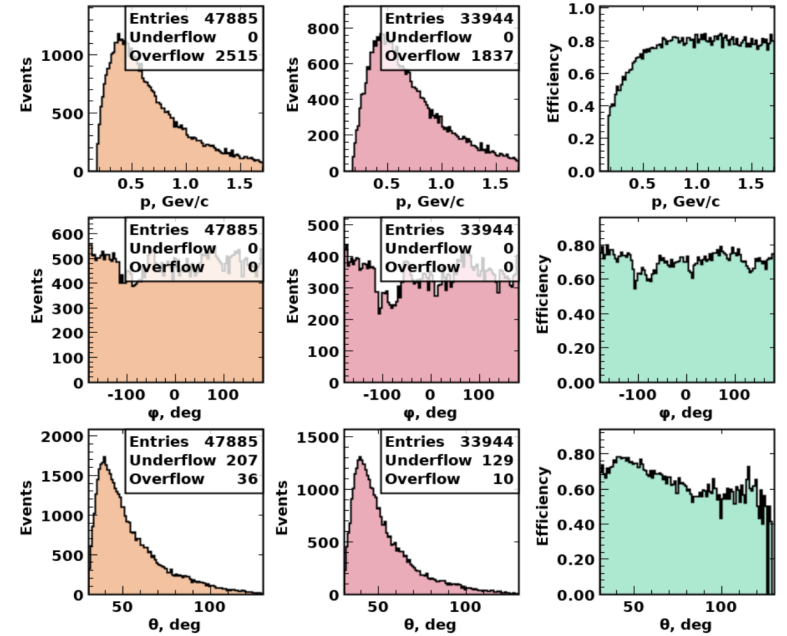


Plots from cut match

events: 80000 with single tracks no bg: 28851 with bg: 19340
 events with multitracks no bg: 8106 with bg: 49780
 events with no tracks no bg: 43043 with bg: 10880
 events with SVT only seeds no bg: 391 with bg: 549
 tracks no bg: 47207 with bg: 183000
 tracks matched by cuts: 14334 / 47207 efficiency: 30%
 full matched tracks: 5054 / 47207 efficiency: 11%
 matched tracks: 6446 / 47207 efficiency: 14%

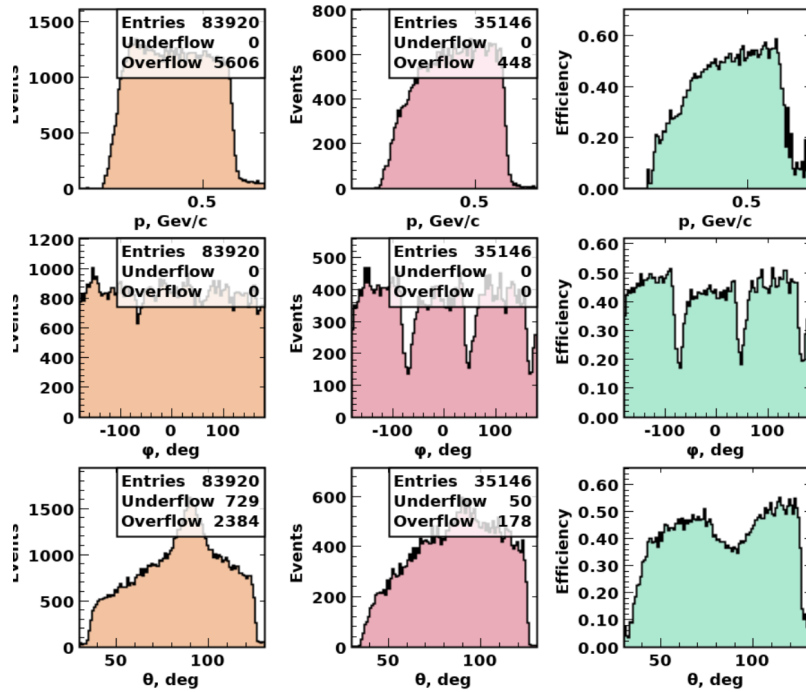
DevM5 1/18/23

RG-B



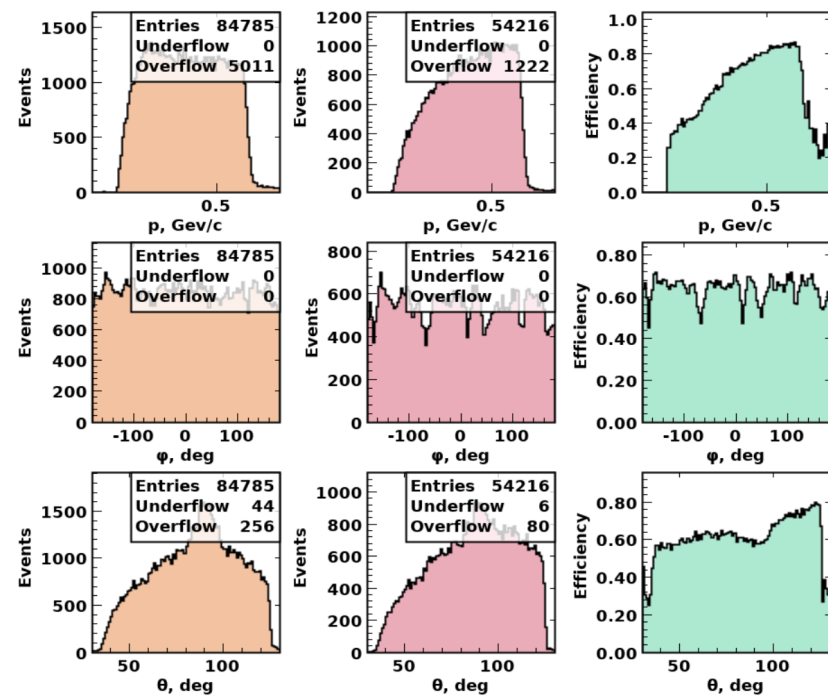
events: 80000 with single tracks no bg: 29917 with bg: 26270
 events with multitracks no bg: 8007 with bg: 34723
 events with no tracks no bg: 42076 with bg: 19007
 events with SVT only seeds no bg: 789 with bg: 602
 tracks no bg: 47885 with bg: 125467
 tracks matched by cuts: 33944 / 47885 efficiency: 71%
 full matched tracks: 27668 / 47885 efficiency: 58%
 matched tracks: 32368 / 47885 efficiency: 68%

π^- , 0.1-0.6 GeV, RGB BG 50 nA



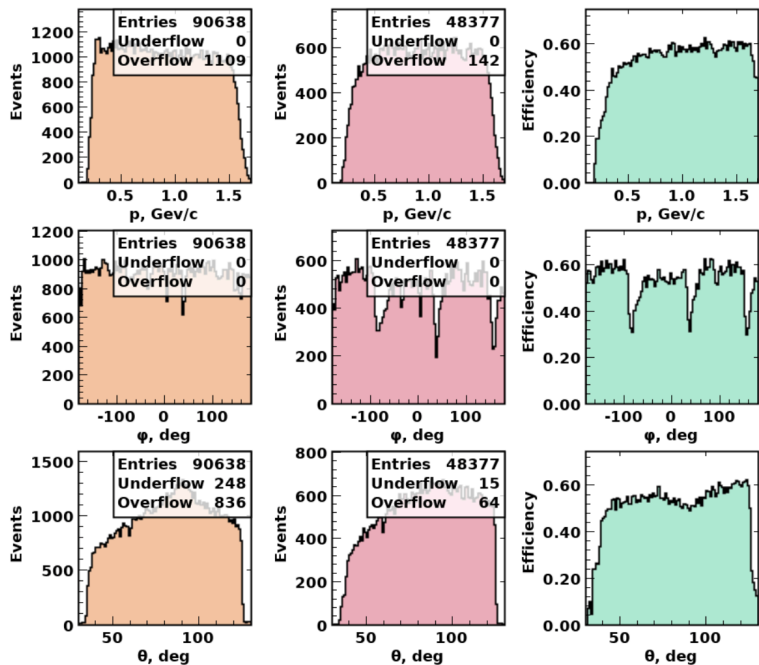
events: 100000 with single tracks no bg: 64733 with bg: 24607
 events with multitracks no bg: 5069 with bg: 66972
 events with no tracks no bg: 30198 with bg: 8421
 events with SVT only seeds no bg: 567 with bg: 722
 tracks no bg: 83920 with bg: 250450
 tracks matched by cuts: 35146 / 83920 efficiency: 42%
 full matched tracks: 6826 / 83920 efficiency: 8%
 matched tracks: 9583 / 83920 efficiency: 11%

π^- , 0.1-0.6 GeV, RGB BG 50 nA



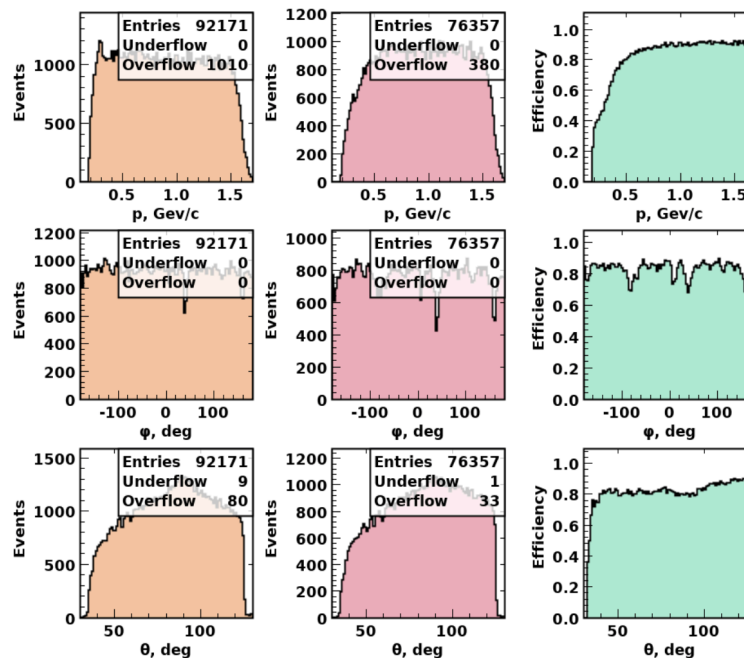
events: 99968 with single tracks no bg: 65677 with bg: 37061
 events with multitracks no bg: 4802 with bg: 51733
 events with no tracks no bg: 29489 with bg: 11174
 events with SVT only seeds no bg: 465 with bg: 613
 tracks no bg: 84785 with bg: 198171
 tracks matched by cuts: 54216 / 84785 efficiency: 64%
 full matched tracks: 42025 / 84785 efficiency: 50%
 matched tracks: 51303 / 84785 efficiency: 61%

π^- , 0.1-1.6 GeV, RGB BG 50 nA



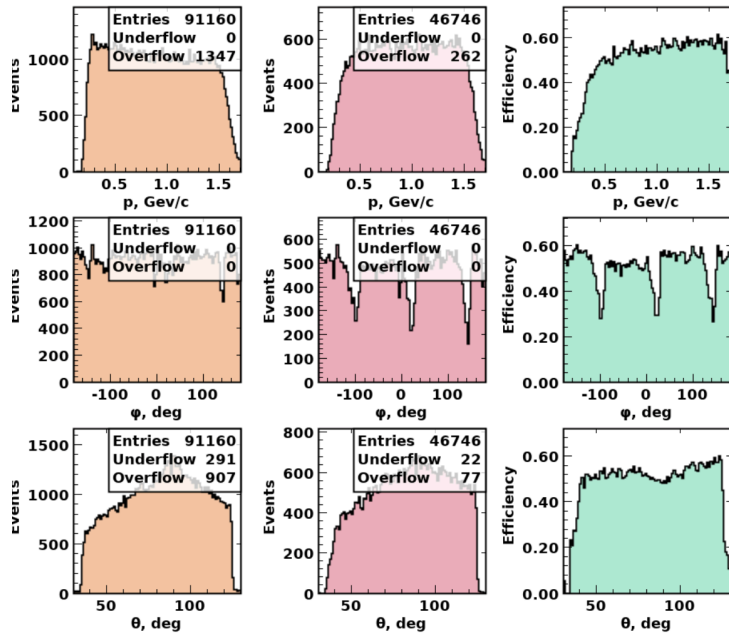
events: 100000 with single tracks no bg: 84184 with bg: 24683
 events with multitracks no bg: 1786 with bg: 70861
 events with no tracks no bg: 14030 with bg: 4456
 events with SVT only seeds no bg: 2016 with bg: 694
 tracks no bg: 90638 with bg: 259222
 tracks matched by cuts: 48377 / 90638 efficiency: 53%
 full matched tracks: 10632 / 90638 efficiency: 12%
 matched tracks: 15966 / 90638 efficiency: 18%

π^- , 0.1-1.6 GeV, RGB BG 50 nA



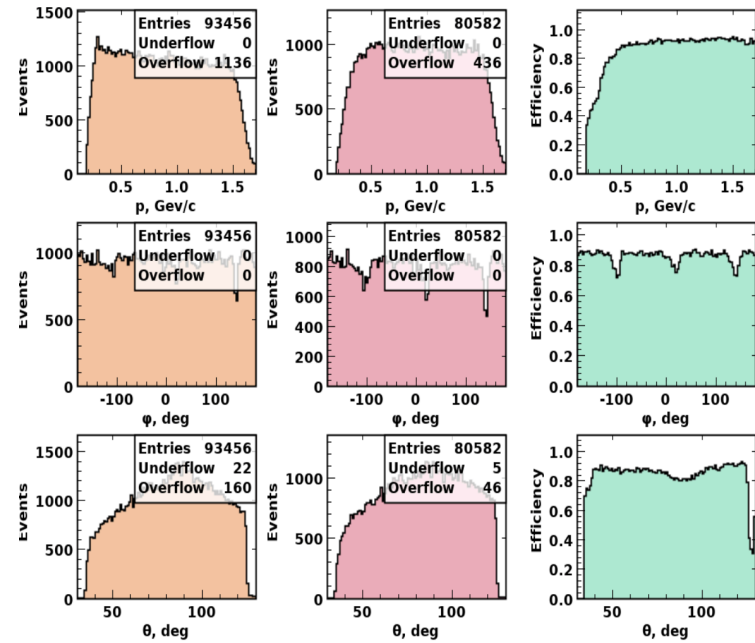
events: 99987 with single tracks no bg: 85602 with bg: 41023
 events with multitracks no bg: 1725 with bg: 53944
 events with no tracks no bg: 12660 with bg: 5020
 events with SVT only seeds no bg: 1930 with bg: 955
 tracks no bg: 92171 with bg: 198607
 tracks matched by cuts: 76357 / 92171 efficiency: 83%
 full matched tracks: 62012 / 92171 efficiency: 67%
 matched tracks: 73570 / 92171 efficiency: 80%

π^+ , 0.1-1.6 GeV, RGB BG 50 nA



events: 100000 with single tracks no bg: 83928 with bg: 24544
 events with multitracks no bg: 1995 with bg: 71120
 events with no tracks no bg: 14077 with bg: 4336
 events with SVT only seeds no bg: 1975 with bg: 753
 tracks no bg: 91160 with bg: 261179
 tracks matched by cuts: 46746 / 91160 efficiency: 51%
 full matched tracks: 10996 / 91160 efficiency: 12%
 matched tracks: 16318 / 91160 efficiency: 18%

π^+ , 0.1-1.6 GeV, RGB BG 50 nA



events: 99978 with single tracks no bg: 86477 with bg: 41075
 events with multitracks no bg: 1781 with bg: 54393
 events with no tracks no bg: 11720 with bg: 4510
 events with SVT only seeds no bg: 1916 with bg: 1013
 tracks no bg: 93456 with bg: 200368
 tracks matched by cuts: 80582 / 93456 efficiency: 86%
 full matched tracks: 64582 / 93456 efficiency: 69%
 matched tracks: 77318 / 93456 efficiency: 83%