Track Param Optimization (Small Angle Approx)

Ali Usman

CRSNG NSERC

University of Regina

Jefferson Lab

Recall

➢ Looked at HMS using online replay script.

➢ Used latest calibrations for the replays.

➢ A comparison b/w two tracking efficiency algorithm was shown in the last meeting.

➢ There was no difference b/w efficiencies for two algorithms.

Overview

➢ Had a detailed correspondence with Mark regarding tracking efficiencies from different algorithms.

➢ Mark suggested to look at the track parameters and compare the tracking efficiencies using different values for these parameters.

➢ These parameters are can be changed in

PARAM/HMS/GEN/htracking.param

➢ There are multiple parameters for a track which was shown in an earlier presentation (~ 2 months ago).

Track Parameters

Using_Scin	Using_Prune
sel_chi2_fpperdegmax	prune_xp
sel_dedx1min	prune_yp
sel_dedx1max	prune_ytar
sel_betamin	prune_delta
sel_betamax	prune_beta
sel_etmin	prune_df
sel_etmax	prune_npmt
sel_ndegreesmin	prune_chibeta
	prune_fptime

What needs to be investigated?

➤ Are the cuts on raw TDC Time good ?

➤ Are the parameters for cluster finding reasonable ?

➤ How does the ntrack>0/all events change with different cluster finding/matching?

➤ Is it better to use a minimum of 4 or 5 hits per chamber?

➤ What do the residuals look like?

➤ What does chi-sq distribution for the tracks look like?

➤ How does the chi-distribution change with different cluster finding and then track selection?

➤ Do we need to use the small angle approximation ?

➤ Are the angles in the focal plane too large for this to help?

Hcana files

➢ Looked into hcana for detail implementation of track parameters.

➢ Track parameters are distributed among following files in hcana source directory

THcDriftChamber*

THcDC*

➢ There are some additional files for Track definition as well as golden track selection.

➢ Currently looking at "SmallAngleApprox" parameter for HMS.

SmallAngleApprox

➢ This parameter is used for "Left/Right" decision for the X plane.

➢ There are two type of "SmallAngleApprox" conditions which correspond to old and new chamber planes layout.

➢ The conditions are a bit confusing as "HMS Style" condition correspond to old layout of chamber planes and "SOS Style" condition correspond to new layout of chamber planes.

➢ This variable can either be turned on or off in the param file.

➢ A comparison of tracking efficiencies is done by switching this variable on and off.

HMS Efficiency (Small Angle = 0)

Run Number	Energy	Current	P , Angle	¾ Trig Rate (KHz)	Efficiency	Did Counts	Should Counts
4865	10.6	50	- 6.59, 11.91	51.79	99.69 ± 0.04	19630	19691
4867	10.6	50	- 6.59, 11.91	34.26	99.57 ± 0.05	18168	18246
5015	10.6	60	- 4.20, 14.79	45.84	99.56 ± 0.06	10944	10992
5017	10.6	60	- 4.20, 14.79	45.78	99.69 ± 0.05	10942	10976
5020	10.6	60	- 4.20, 14.79	31.19	99.67 ± 0.06	9937	9970
5025	10.6	60	- 4.20, 14.79	42.31	99.55 ± 0.07	9774	9818
5035	10.6	60	- 4.20, 14.79	25.55	99.65 ± 0.06	9204	9236
5080	10.6	35	- 4.20, 14.79	23.50	99.77 ± 0.05	11165	11191
5085	10.6	35	- 4.20, 14.79	27.56	99.66 ± 0.05	11619	11659
6638	3.8	16	- 0.89, 21.19	85.93	99.62 ± 0.06	10583	10623
6642	3.8	16	- 0.89, 21.19	86.95	99.75 ± 0.05	10985	11012
6644	3.8	24	- 0.89, 21.19	129.75	99.74 ± 0.05	11239	11268
6646	3.8	32	- 0.89, 21.19	175.03	99.72 ± 0.05	11199	11230
6718	3.8	50	- 0.97, 21.19	203.25	99.78 ± 0.05	9540	9561
6720	3.8	50	- 0.97, 21.19	156.96	99.68 ± 0.06	9416	9446
7871	6.8	70	- 2.18, 27.27	13.27	99.63 ± 0.06	11397	11439
7877	6.8	70	- 2.18, 27.27	13.07	99.78 ± 0.04	11508	11533
7915	6.8	40	- 0.88, 36.15	69.28	99.80 ± 0.13	2741	2753
7920	6.8	40	0.88, 36.15	62.77	99.72 ± 0.11	2458	2465

HMS Efficiency (Small Angle = 1)

Run Number	Energy	Current	P , Angle	¾ Trig Rate (KHz)	Efficiency	Did Counts	Should Counts
4865	10.6	50	- 6.59, 11.91	51.79	99.82 ± 0.03	19655	19691
4867	10.6	50	- 6.59, 11.91	34.26	99.81 ± 0.03	18212	18246
5015	10.6	60	- 4.20, 14.79	45.84	99.73 ± 0.05	10962	10992
5017	10.6	60	- 4.20, 14.79	45.78	99.82 ± 0.04	10956	10976
5020	10.6	60	- 4.20, 14.79	31.19	99.79 ± 0.05	9949	9970
5025	10.6	60	- 4.20, 14.79	42.31	99.74 ± 0.05	9792	9818
5035	10.6	60	- 4.20, 14.79	25.55	99.87 ± 0.04	9224	9236
5080	10.6	35	- 4.20, 14.79	23.50	99.87 ± 0.03	11176	11191
5085	10.6	35	- 4.20, 14.79	27.56	99.78 ± 0.04	11633	11659
6638	3.8	16	- 0.89, 21.19	85.93	99.83 ± 0.04	10605	10623
6642	3.8	16	- 0.89, 21.19	86.95	99.95 ± 0.02	11007	11012
6644	3.8	24	- 0.89, 21.19	129.75	99.90 ± 0.03	11257	11268
6646	3.8	32	- 0.89, 21.19	175.03	99.85 ± 0.04	11213	11230
6718	3.8	50	- 0.97, 21.19	203.25	99.88 ± 0.03	9550	9561
6720	3.8	50	- 0.97, 21.19	156.96	99.90 ± 0.03	9437	9446
7871	6.8	70	- 2.18, 27.27	13.27	99.87 ± 0.03	11424	11439
7877	6.8	70	- 2.18, 27.27	13.07	99.91 ± 0.03	11523	11533
7915	6.8	40	- 0.88, 36.15	69.28	99.82 ± 0.08	2748	2753
7920	6.8	40	0.88, 36.15	62.77	99.84 ± 0.08	2461	2465

Outlook

➢ The "SmallAngleApprox" variable comparison shows that when we turn it on (set to 1), the efficiency is improved.

➢ Need to look at other track parameters and see their impact on tracking efficiency.

➢ Need to optimize the these track parameters.

➢ Later on need to look at parameters within different algorithms.

➢ Also need to investigate the SHMS tracking efficiency as well.