SHMS Tracking Efficiency & Track Parameter Optimization

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Recall

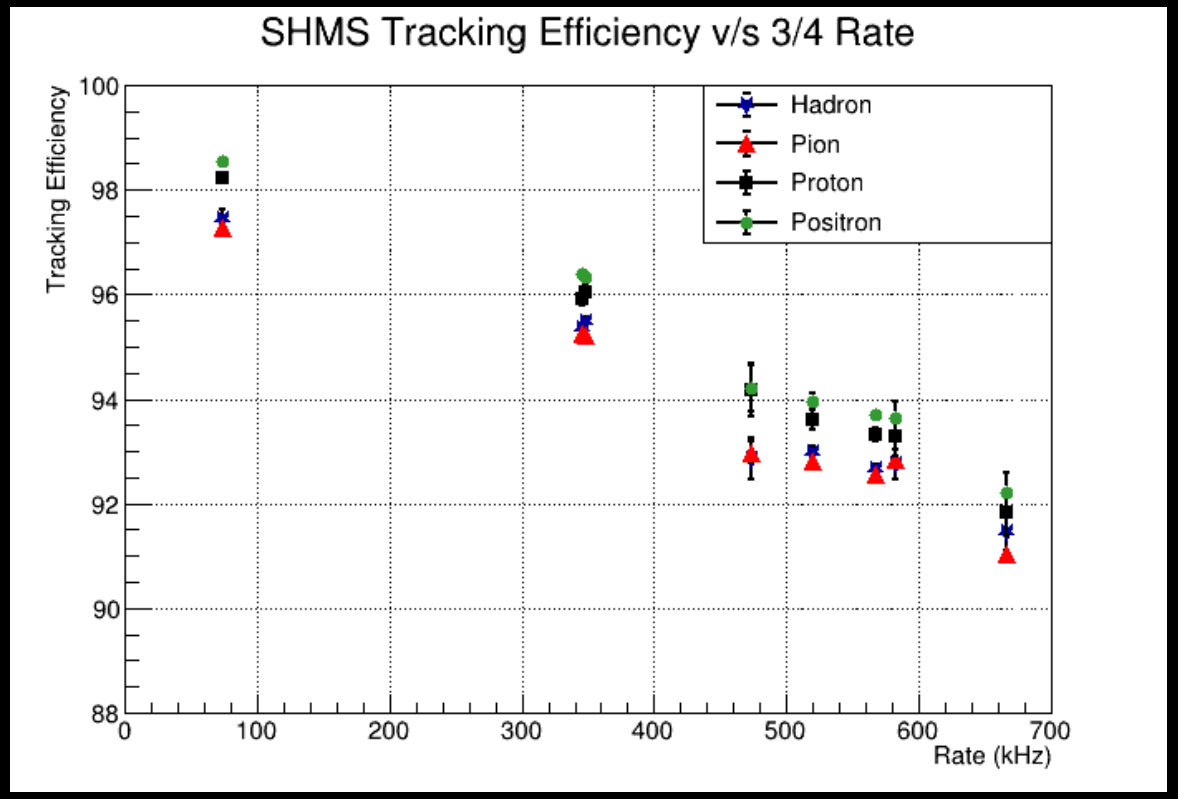
- Was looking at efficiency v/s rate for different type of particles in both SHMS and HMS.
- Was looking at a bunch of spring runs with fixed kinematics and varying current.
- Some outlier were observed in efficiency plots which correspond to crapy runs with very low statistics.
- It was suggested to look at efficiency v/s first hodoscope plane rate (S1X).

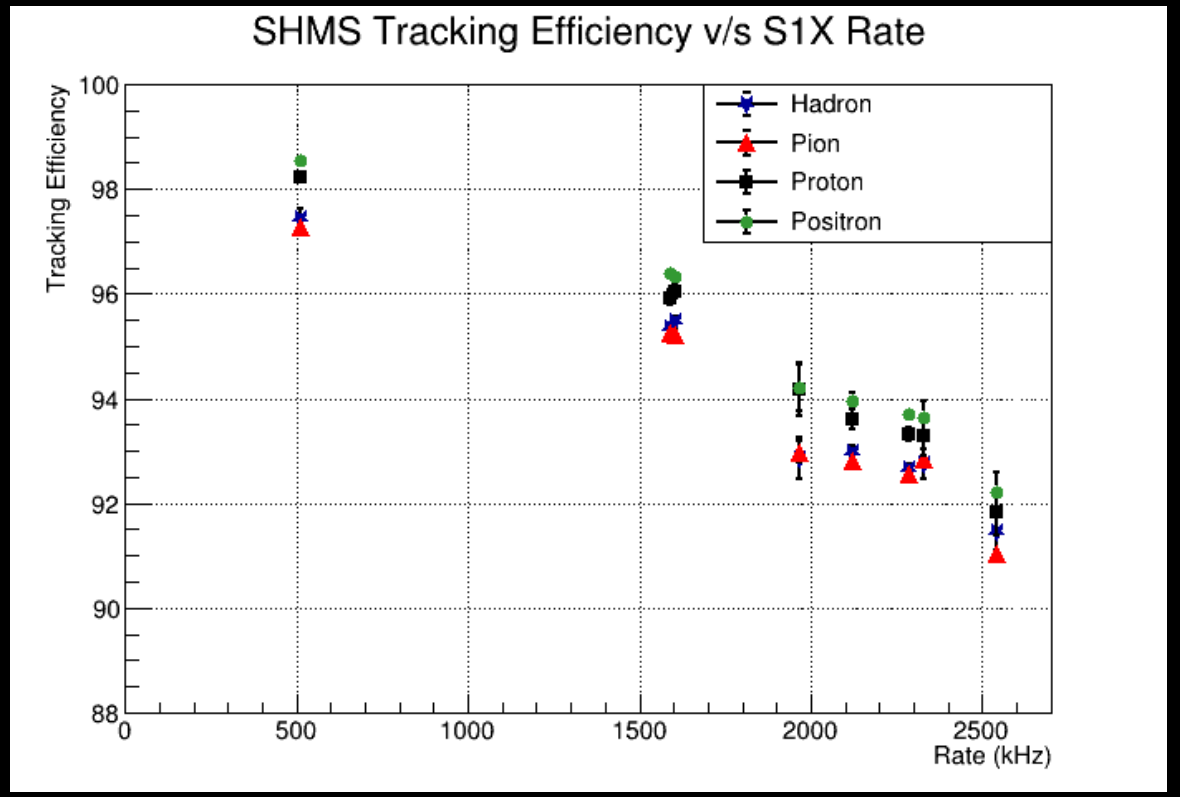
Kinematic Settings

- Run # 8038, 8040, 8042, 8043, 8056, 8057, 8066, 8085
- E = 8.2 GeV

Spec.	P	Angle
HMS	**-1.82 GeV**	**25.89**
SHMS	+6.05 GeV	**6.91**

Tracking Efficiency



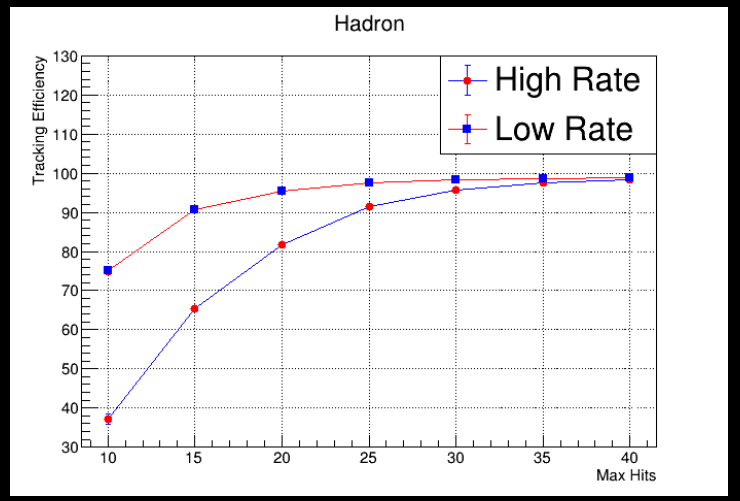


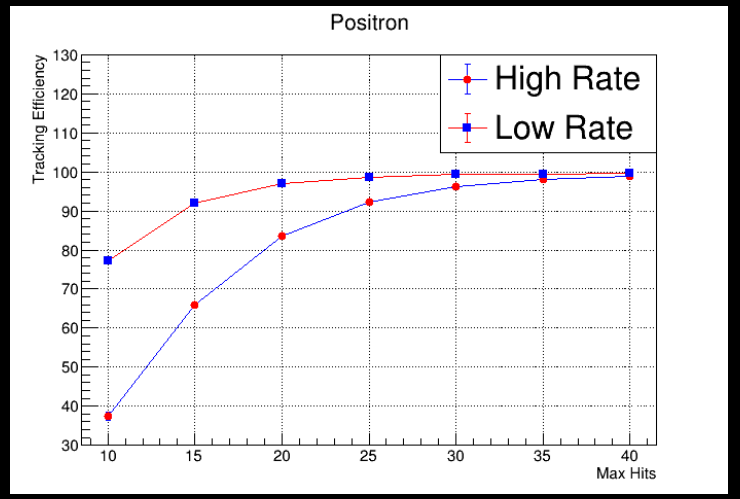
Track Selection Parameter

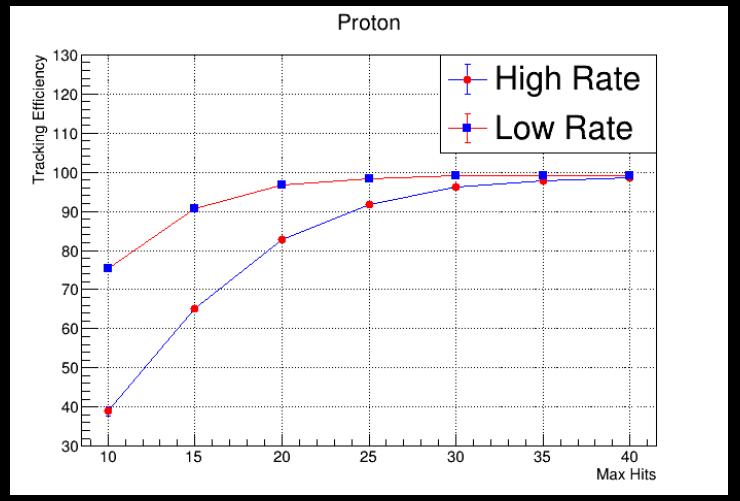
Parameter	Default value
Pmax_pr_hits	25, 25
Pmin_hit	4, 4
Pmin_combo	3, 3
Pspace_point_criterion	1.2, 1.2
Pntracks_max_fp	10
Pntracks_max_fp	10
Pxt_track_criterion	100
Pxy_track_criterion	20
Pxpt_track_criterion	1
Pypt_track_criterion	1

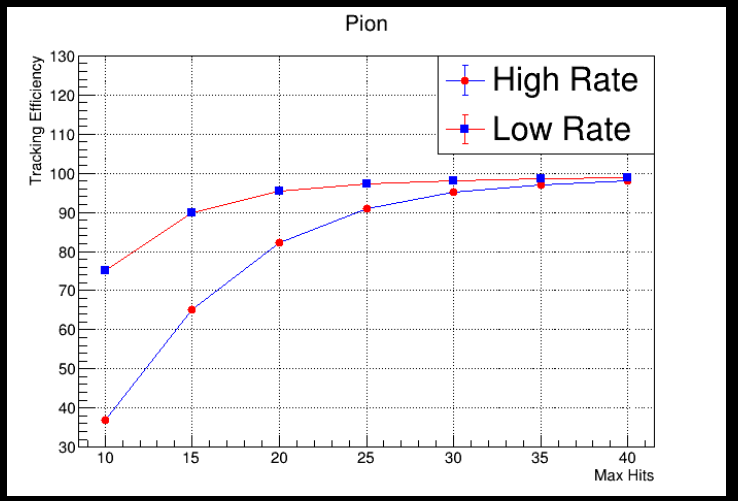
Max_Hits

- High Rate
  - Run # 8038
  - ¾ rate -> 667 kHz
  - S1X rate -> 2541 kHz
- Low Rate
  - Run # 8085
  - ¾ rate -> 73 kHz
  - S1X rate -> 509 kHz



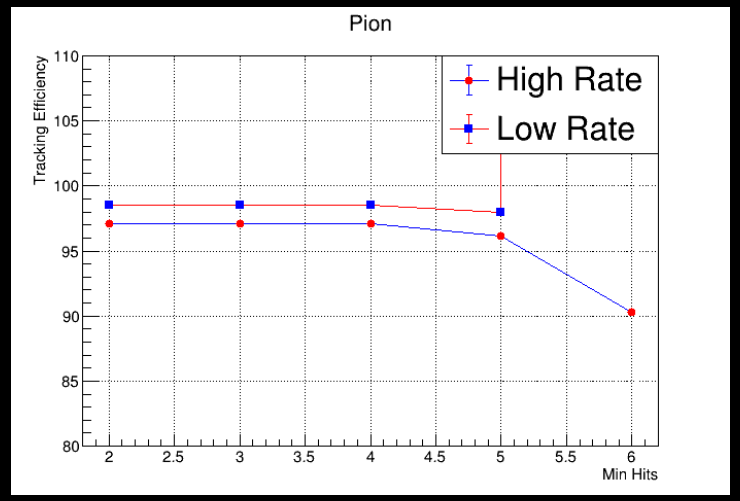


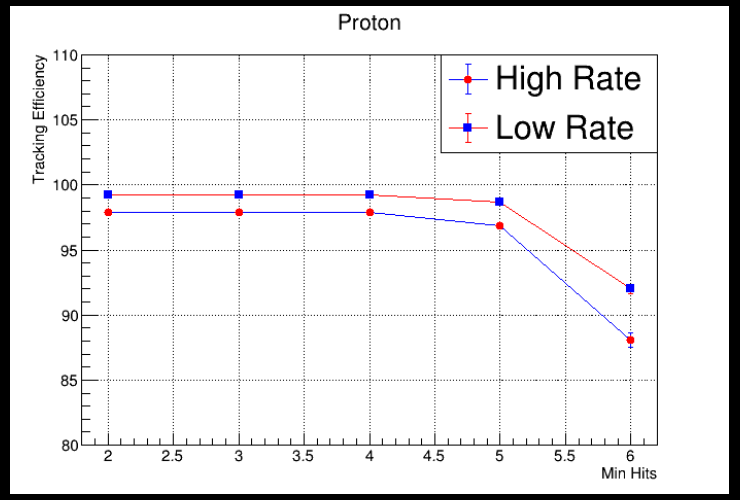


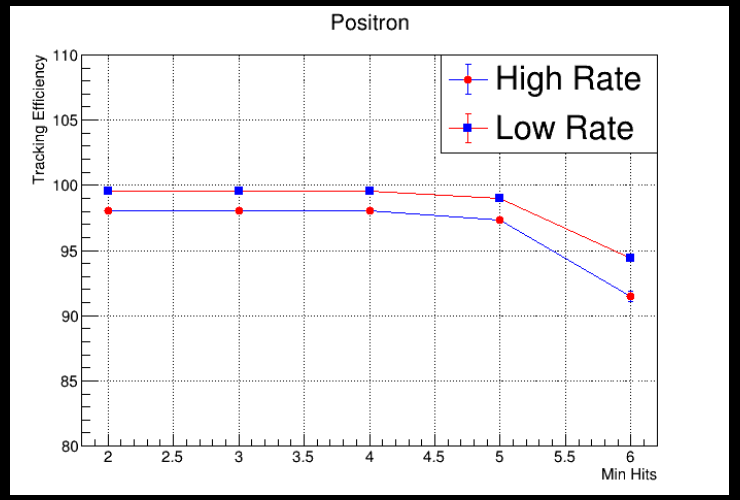


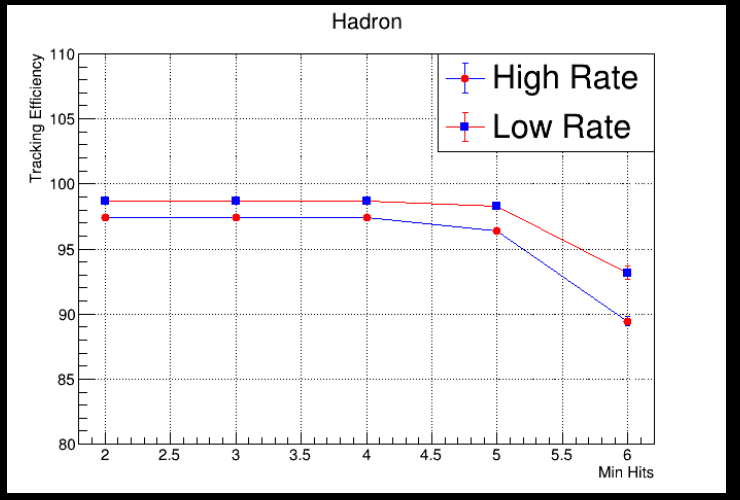
Min_Hits

- For this step
  - Max_Hits = 35, 35
- High Rate
  - Run # 8038
  - ¾ rate -> 667 kHz
  - S1X rate -> 2541 kHz
- Low Rate
  - Run # 8085
  - ¾ rate -> 73 kHz
  - S1X rate -> 509 kHz









Min_Combo

- For this step
  - Max_Hits = 35, 35
  - Min_Hits = 4, 4

- High Rate
  - Run # 8038
  - ¾ rate -> 667 kHz
  - S1X rate -> 2541 kHz

- Low Rate
  - Run # 8085
  - ¾ rate -> 73 kHz
  - S1X rate -> 509 kHz

Value	Positron	Hadron	Pion	Proton
2, 2	98.05±0.19 99.51±0.09	97.45±0.18 98.69±0.22	97.12±0.10 98.53±0.06	97.88±0.23 99.22±0.11
3, 3	98.05±0.19 99.51±0.09	97.45±0.18 98.69±0.22	97.12±0.10 98.53±0.06	97.88±0.23 99.22±0.11
4, 4	98.05±0.19 99.51±0.09	97.45±0.18 98.69±0.22	97.12±0.10 98.53±0.06	97.88±0.23 99.22±0.11

Summary & Outlook

- The overall trend of efficiency with two different rates is similar.
- Will include slope in the efficiency v/s rate plots in future.
- Track selection parameters are giving interesting results v/s efficiency.
- Will finish the remaining track selection parameters.
- Will try and calculate the yield in order to make sure efficiencies are reasonable.

Backup

Introduction

- Tracking Efficiency is calculated in the coin report files.
- Using new cut and template files for the replays.
- Calculating efficiencies for both HMS and SHMS simultenously.

$$\text{Tracking Efficiency} = \frac{(s)hmsscindid}{(s)hmsscinshould}$$

- Trying to check the stability of calculation with default track parameters.

Tracking Cuts

- (s)hmsscinshould = hod + PID
  - hod = goodscinhit + goodstarttime + betanotrack
- (s)hmsscindid = (s)hmsscinshould + dc.ntrack > 0
- PID cuts

Det	SHMS			HMS	
	Positron	Pion	Proton	Electron	Hadron
HGC	> 1.5	> 1.5	<= 1.5	> 0.5	< 0.5
Cal	> 0.6 & < 1.6	<= 0.6 & > 0	<= 0.6 & > 0	> 0.6 & < 2.0	< 0.6 & > 0
Aero	> 1.5	> 1.5	<= 1.5		