# SHMS Tracking Efficiency 

Ali Usman

GRSNG
NSERG
Jefferson Lab

## Recall

> A bug in the DEF-files corresponding to efficiency calculation was fixed.
$>$ Was trying to implement new PID cuts for individual particle efficiency but had issues with pion and proton efficiencies.
$>$ Some of the DEF-files and the Template files were in the process of being updated.
$>$ Looked at the comparison of hadron tracking efficiency for couple of runs before and after the changes.

## Updated Files

$>$ The DEF-files are now updated with new PID cuts on individual particles.

DEF-files/SHMS/PRODUCTION/CUTS/pstackana_reconstruct_cuts.def
$>$ The file also includes updated definitions for the efficiency calculation variables.

> | 'ShmsScinShould' |
| :--- |
| 'ShmsScinDid' |

$>$ The template file used for the generation of report files is also updated with new variables.

TEMPLATES/SHMS/PRODUCTION/pstackana_production.template

## New Cuts

$>$ HGC

$$
\begin{array}{ll}
>\mathrm{E} & \text { P.hgcer.npeSum }>1.5 \\
>\mathrm{Pi} & \text { P.hgcer.npeSum }>1.5 \\
>\mathrm{P} & \text { P.hgcer.npeSum }<=1.5
\end{array}
$$

Aero
$>\mathrm{E} \quad$ P.aero.npeSum > 1.5
$>\mathrm{Pi} \quad$ P.aero.npeSum $>1.5$
$>P \quad$ P.aero.npeSum $<=1.5$
$>$ Cal
$>$
P.cal.etotnorm > 0.6 \& \& P.cal.etotnorm < 1.6
$>$ Pi P.cal.etotnorm <=0.6 \& \& P.cal.etotnorm >0
$>P \quad$ P.cal.etotnorm <= 0.6 \&\& P.cal.etotnorm $>0$

| shmsScinShould | shmsScinGood \&\& shmsGoodBetanotrk |
| :--- | :--- |
| shmsScinShoulde | shmsScinShould \&\& pcut_elec_all |
| shmsScinShouldpi | shmsScinShould \&\& pcut_pi_all |
| shmsScinShouldp | shmsScinShould \&\& pcut_P_all |
| shmsScinShouldh | shmsScinShould \&\& P.cal.etotnorm <= 0.6 \&\& P.cal.etotnorm > 0 . |
| shmsScinDid | shmsScinShould \&\& P.dc.ntrack >0 |
| shmsScinDide | shmsScinShoulde \&\& P.dc.ntrack >0 |
| shmsScinDidpi | shmsScinShouldpi \&\& P.dc.ntrack >0 |
| shmsScinDidp | shmsScinShouldp \&\& P.dc.ntrack >0 |
| shmsScinDidh | shmsScinShouldh \&\& P.dc.ntrack >0 |
|  | Ali Usman |

## SHMS Track Parameters

| Parameter | Values |
| :---: | :---: |
| pmin_hit | 4,4 |
| pmin_combos | 3,3 |
| pspace_point_criterion | $1.2,1.2$ |
| pxt_track_criterion | 100.0 |
| pyt_track_criterion | 100.0 |
| pxpt_track_criterion | 1.0 |
| pypt_track_criterion | 1.0 |
| pSmallAngleApprox | 0 |
| pstub_max_xpdiff | 0.2 |

## SHMS Tracking Efficiencies (50k)

$$
>\mathrm{E}=8.2 \mathrm{GeV}
$$

$\mathrm{P}=+6.05 \mathrm{GeV}$
Efficiency (Old Had)
$8038 \quad 71 \quad 706.87 \quad 98.92 \pm 0.15$
$97.89 \pm 0.19 \quad 98.94 \pm 0.40 \quad 93.19 \pm 0.32 \quad 92.39 \pm 1.01 \quad 93.37 \pm 0.40 \quad 93.64 \pm 1.06$

| 8051 | 62 | 580.95 | $97.89 \pm 0.19$ | $98.94 \pm 0.40$ | $93.19 \pm 0.32$ | $92.39 \pm 1.01$ | $93.37 \pm 0.40$ | $93.64 \pm 1.06$ |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| 8042 | 48 | 507.71 | $98.28 \pm 0.17$ | $97.67 \pm 0.58$ | $92.77 \pm 0.33$ | $94.42 \pm 0.86$ | $92.71 \pm 0.41$ | $93.64 \pm 1.08$ |



| 8073 | 19 | 423.35 | $98.46 \pm 0.17$ | $99.24 \pm 0.34$ | $93.38 \pm 0.33$ | $94.26 \pm 0.90$ | $93.08 \pm 0.42$ | $94.15 \pm 1.09$ |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |


| 8056 | 41 | 352.22 | $97.95 \pm 0.17$ | $98.33 \pm 0.45$ | $95.35 \pm 0.24$ | $96.18 \pm 0.67$ | $95.08 \pm 0.31$ | $95.73 \pm 0.81$ |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |

$8092 \quad 2$ ?? $\quad 315.66 \quad 97.90 \pm 0.22 \quad 99.47 \pm 0.30 \quad 94.09 \pm 0.34 \quad 94.40 \pm 0.96 \quad 93.93 \pm 0.44 \quad 94.77 \pm 1.07$
$8054 \quad 10 \quad 76.19 \quad 99.38 \pm 0.10 \quad 96.10 \pm 0.25 \quad 97.53 \pm 0.60 \quad 96.18 \pm 0.30 \quad 95.51 \pm 0.92$

## SHMS Tracking Efficiencies (100k)

| 8.2 |  |  | $\mathrm{P}=+6.05 \mathrm{GeV}$ |  |  | Angle = |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Run \# | 1 (uA) | Rate (\%/4) | Efficiency <br> (New Had) | Efficiency <br> (New Pi) | Efficiency <br> (New P) | Efficiency <br> (New E) |
| 8038 | 71 | 706.87 | $90.84 \pm 0.28$ | $90.94 \pm 0.36$ | $91.07 \pm 0.97$ | $93.47 \pm 0.74$ |
| 8051 | 62 | 580.95 | $92.93 \pm 0.23$ | $92.99 \pm 0.29$ | $94.15 \pm 0.71$ | $93.01 \pm 0.70$ |
| 8042 | 48 | 507.71 | $92.67 \pm 0.24$ | $92.55 \pm 0.30$ | $93.33 \pm 0.78$ | $93.81 \pm 0.64$ |
| 8091 | 8 ?? | 483.18 | $93.07 \pm 0.24$ | $93.00 \pm 0.30$ | $94.98 \pm 0.69$ | $93.62 \pm 0.67$ |
| 8073 | 19 | 423.35 | $93.19 \pm 0.23$ | $93.02 \pm 0.30$ | $93.72 \pm 0.79$ | $94.02 \pm 0.64$ |
| 8056 | 41 | 352.22 | $95.34 \pm 0.17$ | $95.96 \pm 0.22$ | $96.32 \pm 0.53$ | $96.13 \pm 0.48$ |
| 8092 | 2 ?? | 315.66 | $93.34 \pm 0.25$ | $93.07 \pm 0.32$ | $95.00 \pm 0.71$ | $94.25 \pm 0.65$ |
| 8054 | 10 | 76.19 | $96.00 \pm 0.25$ | $96.09 \pm 0.30$ | $95.54 \pm 0.89$ | $97.38 \pm 0.60$ |

## Summary \& Outlook

$>$ The changes are now working properly and there is a reasonable trend in the efficiencies.
$>$ The 50k replay was giving large error for individual particles so moved to 100k replay now.
> Will start looking at the individual track parameters and try to optimize them for a wide range of rates.
$>$ Will start ploting these numbers instead of listing in tables.

