ΛΛ̄ efficiencies with PndSttMvdGemIdealTracker after bug fix

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A bug in the ideal track finder

A bug in the ideal track finder (PndSttMvdGemTrackingIdeal.cxx) was discovered in (05/12/15). The bug limited the total number of STT hits in an event to 25.

- The cut was wrongly applied to each event instead of each track
- The purpose of the cut is to simplify the reconstruction of slow charged particles that loop in the STT
- The bug is present in the oct14 and mar15 releases

Example event: $\bar{p}p \to \Xi^{+}\Xi(1690)^{-} \to \bar{\Lambda}\pi^{+}\Lambda K^{-}$
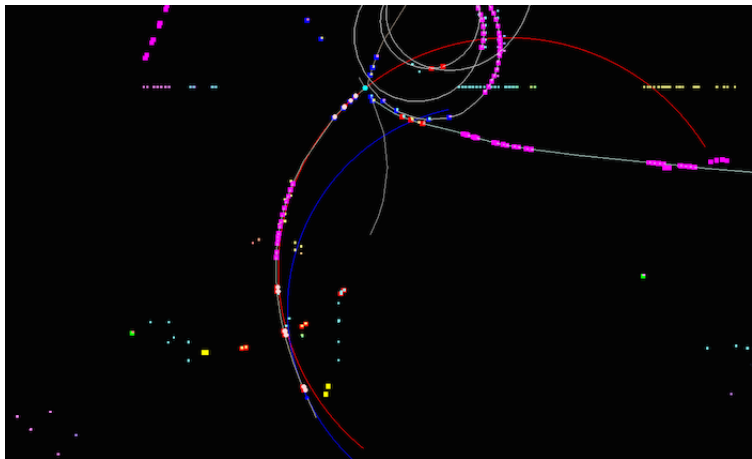

Figure by André Zambanini

Change of PndSttMvdGemTrackingIdeal.cxx

Following lines were removed in r27684 (05/14/15):

```
190  if ( (iDet!=0) || (iDet==0 && multDet[iDet]<=25) )
 cand−>AddHit(fBranchIDs[iDet],ih,rho);
191  multDet[iDet]++;
```

Following lines were added in r27684 and then removed in r27686
(05/15/15):

```
194  if (iDet==0) {
195      if(track_to_sttnofhits.count(trackID) == 0) {
196          track_to_sttnofhits[trackID] = 1;
197          cand−>AddHit(fBranchIDs[iDet],ih,rho);
198      }
199  } else {
200      if (track_to_sttnofhits[trackID] <= 25)
  cand−>AddHit(fBranchIDs[iDet],ih,rho);
201          track_to_sttnofhits[trackID]++;
202      }
203  }
```

Simulation

$p\overline{p} \rightarrow \Lambda\overline{\Lambda}_0$ process

- 10.000 events simulated
- Simulated at 1.64 GeV/c and 4.0 GeV/c beam momentum
- Generated with $\overline{\Lambda^0}$ forward peaking distribution
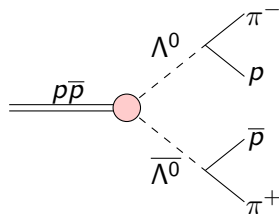- Four charged tracks from displaced vertices
- PndLLbarAnaTask.cxx

Figure: $\Lambda^0\overline{\Lambda^0}$ production- and decay channel

Software versions used

FairSoft: mar15
FairRoot: v-15.03
PandaRoot: release mar15

Efficiencies @ 4.00 GeV/c beam momentum

	mar15	Fixed tracker	ΔN		$\sigma_{\Delta N}$
π^+	6935	6889	-46	$\pm$	118
π^-	4596	4507	-89	$\pm$	96
p	1820	1899	79	$\pm$	61
$\overline{p}$	6702	6734	32	$\pm$	116
Λ_0	541	643	102	$\pm$	35
$\overline{\Lambda}_0$	4637	4634	-3	$\pm$	97
$\Lambda_0 \overline{\Lambda}_0$	249	288	39	$\pm$	24

Efficiencies @ 1.64 GeV/c beam momentum

	mar15	Fixed tracker	ΔN		$\sigma_{\Delta N}$
π^+	5635	6268	633	$\pm$	110
π^-	6101	5895	-206	$\pm$	110
p	7320	7545	225	$\pm$	122
$\overline{p}$	7094	7288	194	$\pm$	120
Λ_0	4228	4238	10	$\pm$	93
$\overline{\Lambda}_0$	3921	4476	555	$\pm$	92
$\Lambda_0 \overline{\Lambda}_0$	1490	1815	325	$\pm$	58

Summary

- A bug that limits the number of STT hits in an event to 25 is present in the oct14 and mar15 releases
- The fixed track finder can be found in r27686 or later.
- It is recommended to update the ideal tracker.