Checking the H843-1 Ω_C^0 sample

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We have attempted to reproduce the Ω_c^0 samples reported in Hnote 843-1 by reapplying the cuts detailed in the Hnote to the pass2 vtuples. We have failed to confirm the Ω_c^0 signals originally claimed.

1 Introduction

The problems identified during the review of the Ω_c^0 lifetime paper has caused us to go back and check the original event sample selection. The goal here was to repeat what was done in H843-1 and get back the same mass plots with the same mass peaks. The sets and modes used shown in Table 1.

set	charm files	recon ID	mode	$L\sigma$ cut
1	p2b01	828	$\Omega_c^0 \to \Xi^- K^- \pi + \pi^+$	3.5
2	p2b02	829	$\Omega_c^0 \to \Omega^- \pi - \pi + \pi^+$	4.5
3	p2c01	850	$\Omega_c^0 \to \Omega^- \pi +$	3.5
4	p2d01			
5	p2e01			
6	p2f01			
7	p2g01			
8	p2h01			
9	p2p01			
10	p2x01			
11	p2z02			

Table 1: data sets and decay modes

2 Methodology

This work was done in San Luis Potosi where all the Selex data lives on disk. The 3 IDs in Table 1 were stripped from the PASS2 vtuples using vtup_select. A selection routine, select_omegac, was written to implement all the cuts enumerated in H843-1 Section 4. This routine was linked with vtup2ftup to produce a selected data set which was converted with ftup2ntu to a paw ntuple which was used in the usual ways. The l/σ cut was relaxed to the recdf value (see Table 1) for this selection and tightened in paw.

2.1 Results

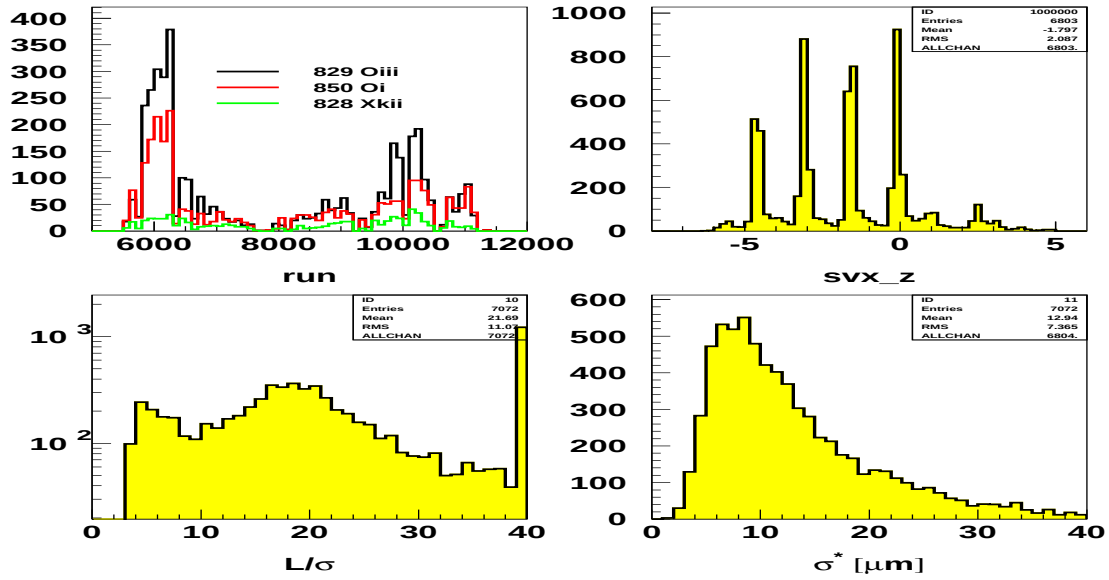

Figure 1: Upper:left: Run Distribution of candidate for each mode, Upper:right: Secondary vertex position, all modes, Lower left: L/σ for all candidates, lower right: Proper decay length resolution σ^*

A feature we observed in the original data set was a very large number of entries for the data set p2b01 (run< 6313). We reproduce this feature as shown in Figure 1(top-left). This is present in the data at the strip stage: of 300K total recons 125K are from p2b01. We've no clue what causes this. p2b01 and p2b02 aren't different in filter, or trigger. The PASS2 executable

changed from devel_102300+ to devel_120700. Something in that change must be responsible.

As shown in Figure 1(top-right) this event sample is dominated by secondary interactions in downstream material. These events are removed in recon_vertex for vertex driven reconstructions but not in candidate or kink driven recons. A typical one of these events has $\sigma \sim 0.08cm$. These secondary interactions produce the lump in the L/σ distrubution, shown in Figure 1(bottom-left), at $L/\sigma = 1.5cm/0.08cm \sim 20$.

Figure 2 shows our reproduction of the mass plots (figure 1) in H843-1. On the left in yellow is the whole data set. The ID=850 Oi plot is nearly identical to H843-1. The other have 1.5 to 2 times as many entries. There are many "features" in the vtuples, for example in one mode has tracks with kaons tagged as anti-protons, etc. We clearly haven't located all these mysteries. In the summed plot (upper left) the background level is not quite twice that of H843-1. There is no ~ 100 mass peak. There is no hint of a mass peak.

The green plots on the right in Figure 2 have the L/σ cut removed $(6 \rightarrow 3.5, 4.5, 3.5)$ and a cut of $L < 1.3cm$ imposed to remove the secondary interactions. The number of entries drops by a factor of 4x and no peaks emerge. The summary of of numbers of events for these three samples are shown in Table 2.

recon	mode	H843-1	H893	$+L < 13mm$
All		~ 2700	4318	936
829	$\Omega_c^0 \rightarrow \Omega^- \pi - \pi + \pi^+$	~ 1100	2549	251
850	$\Omega_c^0 \rightarrow \Omega^- \pi +$	~ 1300	1310	629
828	$\Omega_c^0 \rightarrow \Xi^- K^- \pi + \pi^+$	~ 300	470	52

Table 2: Numbers of entries on mass plots. The H843-1 values are estimated from the plots.

3 Conclusions

We contradict the 100 event Ω_c^0 claim of H843-1. The event sample used there is 3/4 secondary interactions. We are now off looking at kink by disappearance mode to see if we can find Ω_c^0 there.

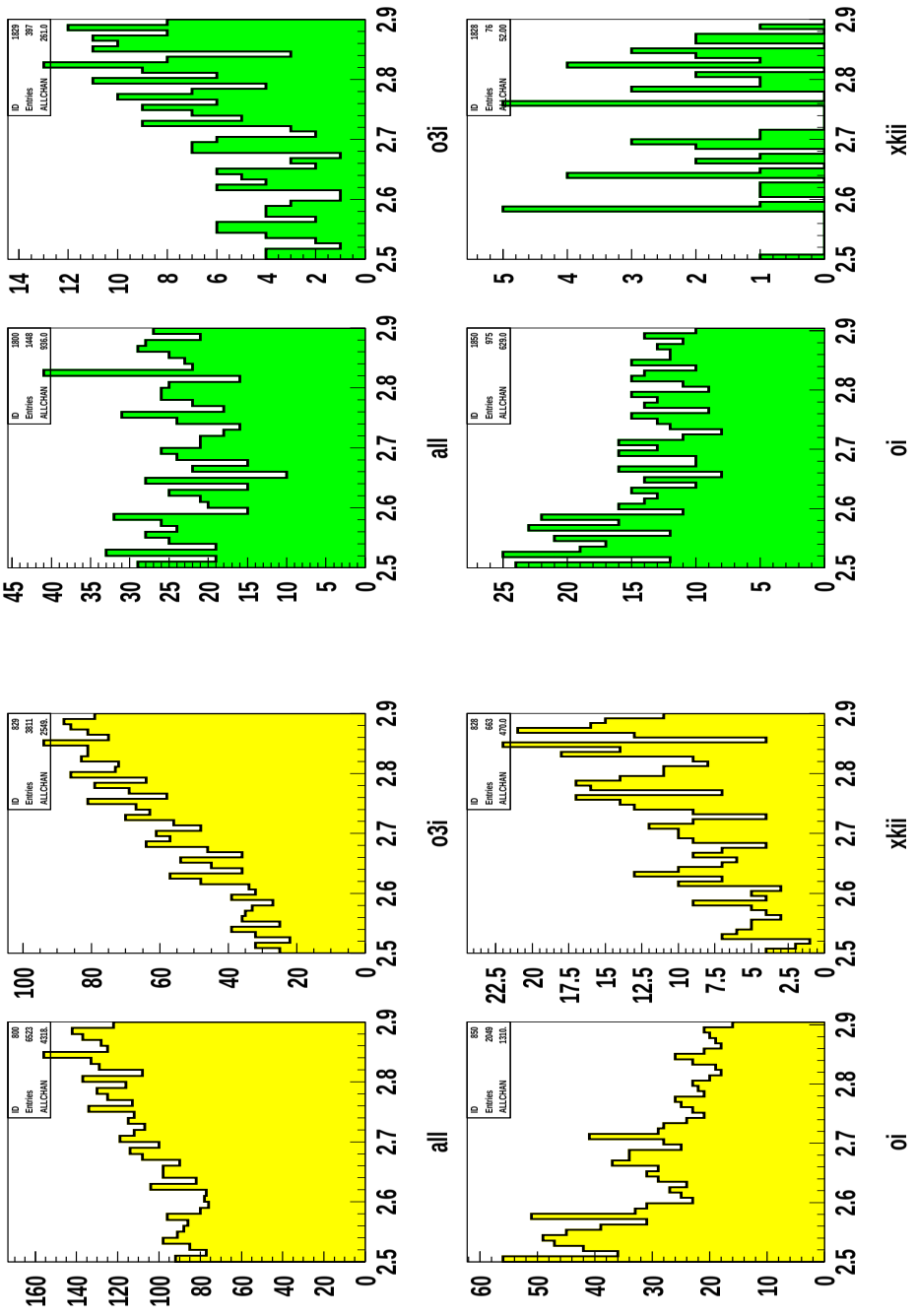

Figure 2: Left: Our reproduction of Figure 1 from Hnote 843-1, Right: Same plot for $L < 1.3$

4 Software

All of this work lives in various computers (ckm06, pcooper, cherenkov) in sub-directories under pcooper like */e781/omegac0/h843*. This hnote is there.