Agenda

1. Overview - David
2. TD Acceptance and rejection - Sasha
3. Kink finder and beam background - Benji
4. CCDPUL fitter - Jim
5. Checking pnn1 PV rejection and acceptance - Dima
6. Kink sample and PV rejection - Ilektra
7. Discussion - All

pnn2: Overview

Goals:

- Complete analysis in timely fashion ($\sim$1 year)
- Use pnn1 cuts as baseline/starting point
- Attain and exceed previous pnn2 S/B $\sim$1/7
- Increase rejection (R) and Acceptance (A) without creating loopholes

We should build on Milind's pioneering 1996 analysis that was verified by Bipul's 1997 analysis:
Careful preparation of samples to study and measure backgrounds and correlations. The result was that no surprises were found when the box was opened.

Reminder of backgrounds from Bipul's 1997 analysis

Bkgd	1997(2/3) DELCO > 6ns	1997(2/3) DELCO (2,6)ns	Tools		
$K_{\pi 2}$-scat	0.39 ± 0.15	0.136 ± 0.070	PV	CCD†	
$K_{\pi 2\gamma}$	0.006 ± 0.002	?	PV		MC
μ	0.009 ± 0.009	?	PV	TD	
2beam KK	0.030 ± 0.030	0.52 ± 0.52*	timing	PID	
2beam Kπ	0.003 ± 0.003	0.037 ± 0.037*	timing	PID	
K_{e4}	0.026 ± 0.026	?	PV	CCD†	MC
CEX	0.013 ± 0.013	?	timing	PV	MC
Relative Acc	1	0.189			

* 0 events left for norm, rej samples

† includes target pattern recognition

Priorities

1. Establish baseline cuts
   - PV(pnn1) : verification (Dima)
   - PV(pnn2) : "optimize" on kink sample (Ilektra)
   - CCDPUL : Adjust cuts for improved fitter (Jim)
   - TD : pnn1 verification (Sasha)
2. Define and blind larger signal box. Increase in kinematic ranges based on measured $K_{\pi 2}$ resolution (TN K-034).

	96-97	2002	Acceptance gain
P	(140,195)	(140,199)	
R	(12,27)	(12,28)	1.07(?)
E	(60,95)	(60,100.5)	
DELCO	> 6	> 2	1.19

Priorities (continued)

3. Develop machinery to measure & investigate backgrounds
   - $K_{\pi 2}$-scatter : Ilektra, (Dima), Jim, Joe, Joss
   - Beam : Benji
   - μ : (Sasha), Aleksei(?)
   - MC-related backgrounds [$K_{\pi 2\gamma}$, K_{e4}, CEX] : Wang, Shaomin
4. Improve Rejection and acceptance

PV	Ilektra	$2 \times$ R?
CCDPUL	Jim, Joe, Joss	$1.1 \times$ A?
TD	Aleksei(?)	$1.05 \times$ A?
Signal box	Wang	$1.07 \times 1.19 \times$ A?

5. MC needs
   (a) $K^+ \to \pi^+ \nu \bar{\nu}$: signal box size
   (b) $K_{\pi 2\gamma}$, K_{e4}, CEX : backgrounds
   (c) $K_{\pi 2}$: acceptance check
   (d) $K^+ \to \pi^+ X$, $K^+ \to \pi^+ XY$(scaler,tensor) : publication

Improving on past pnn2 analyses and other comments

- We have improved methods to "optimize" and measure pnn2 PV
  - "optimize" on kink sample (Q: Should we use 3/3 kink sample?)
  - measure R(PV) on $\overline{\text{CCDPUL}}$ sample
- Past analyses assumed μ background was from μ-band. If TD cuts are loosened, must confirm that μ-tail contribution is negligible. Recall:
  - Bipul's 'odd' event under $K_{\pi 2}$ box in R *vs* P
  - μ-band & μ-tail complications for 2002 pnn1 candidate
- Junk method requires robust knowledge of background as a function of cut severity. Is this possible for pnn2? (Note: We can still use Junk method to combine all pnn1 and pnn2 results with a single 2002 pnn2 "cell").
- How do we measure $K_{\pi 2}$ background in expanded kinematic box since it has two components
  1. $K_{\pi 2}$-scatter and
  2. mismeasurement and tail of $K_{\pi 2}$-peak?

Improving on past pnn2 analyses and other comments (continued)

- How do we estimate beam backgrounds in (2,6) ns region?
- We would like to increase A and R by loosening, removing or improving cuts. It would be a **disaster** if this procedure creates 'loopholes' that permit rare or 'pathological' background to creep in.
  - Use experience from previous analysis to avoid this
  - Provide quantitative justification of each cut change
  - Provide quantitative demonstration that correlation between "orthogonal" cuts remains negligible

Avoid disaster