Status of Beam Studies

April 17, 2003

– Coding and Calibrations

  - Some new codes were developed/some old codes were modified to analyze E949 beam system

  - Calibrations have been checked

– New Cut Functions

Name	Description	Function
TGTCON	requirement of kaon fiber time consistency (TGCCD)	data sample cleanup
B4CCD	reject events with 2nd B4 CCD pulses close to T_{RS} (B4TD)	remove double beam background
CNPE	requirement of $p.e.$ in C_K and C_π	remove 1-beam pion entering background
UPVTRS	reject events with any UPV hits close to T_{RS} (BHTRS)	data sample cleanup
RVTRS	reject events with any RV hits close to T_{RS}	data sample cleanup

– Cut Function Tuning

Cut functions are being tuned based on $K_{\mu 2}$ and $K_{\pi 2}$ acceptance studies and beam background estimate.

Cut	01-02	(# of evts)	98	(# of evts)
ICBIT	1.000	(274668)	1.000	(272770)
TICCON	0.992	(272471)	0.993	(270843)
TIMCON	0.993	(270476)	0.993	(268900)
TGTCON (TGCCD)	0.993	(268495)	0.938	(252266)
DCBIT	0.880	(236272)	0.900	(227127)
DELC	0.876	(206950)	0.881	(199973)
CKTRS	0.983	(203428)	0.994	(198734)
CKTAIL	1.000	(203428)	0.967	(192271)
B4DEDX	0.981	(199587)	0.992	(190794)
CPITRS	0.996	(198756)	0.998	(190502)
CPITAIL	1.000	(198756)	1.000	(190450)
PSCUT	0.970	(192887)	0.995	(189410)
TARGF	0.945	(182263)	0.965	(182806)
DTGTTP	1.000	(182200)	1.000	(182787)
RTDIF	0.989	(180139)	0.989	(180855)
TGQUALT	1.000	(180139)	1.000	(180855)
PIGAP	0.990	(178360)	0.990	(179120)
TGB4	0.955	(170323)	0.946	(169396)
KIC	0.991	(168726)	0.993	(168122)
TGGEO	0.991	(167143)	0.986	(165687)
EIC	0.980	(163812)	0.980	(162312)
EICKIN	0.996	(163223)	1.000	(162312)
B4EKZ	0.973	(158738)	0.980	(158952)
TGZFOOL	1.000	(158738)	1.000	(158952)
TGCUT	0.984	(156211)	1.000	(158937)
BWTRS	0.963	(150472)	0.980	(155716)
UPVTRS (BHTRS)	0.996	(149801)	0.998	(155329)
B4TRS	0.981	(146920)	0.997	(154847)
B4CCD (B4TD)	0.990	(145517)	0.991	(153411)
PBNRS	—		0.994	(152475)
CNPE	0.994	(144640)	—	
RVTRS	1.000	(144623)	—	
$A_{K_{\mu 2}}$	0.5265 ± 0.0015		0.5590 ± 0.0015	

$K_{\mu 2}$-based acceptance study results in comparison with '98.

Following cut functions need further tuning when more statistics is available.

Cut	01-02 (# of evts)	98 (# of evts)
SETUP$_{ops}$	1.000 (2633)	1.000 (3459)
OPSVETO	0.975 (2568)	0.994 (3437)
OPSVETO_LKB	0.982 (2521)	0.992 (3409)
A$_{ops}$	0.9575 ± 0.0191	0.9855 ± 0.0169
SETUP$_{tgkin}$	1.000 (2440)	1.000 (3324)
TGDEDX	0.966 (2358)	0.988 (3285)
TGER	1.000 (2358)	1.000 (3285)
TGLIKE	0.971 (2289)	0.985 (3236)
EPITG	0.998 (2285)	1.000 (3236)
EPIMAXK	0.969 (2214)	0.983 (3182)
TGEDGE	0.982 (2174)	0.998 (3176)
TGCCDPF	—	0.990 (3144)
PHIVTX	1.000 (2174)	0.987 (3102)
PHIVTX2	0.984 (2139)	0.995 (3085)
DRP	0.988 (2114)	0.995 (3069)
A$_{tgkin}$	0.8619 ± 0.0187	0.9233 ± 0.0167
A$_{K_{\pi 2}}$	0.7987 ± 0.0266	0.8873 ± 0.0238

$K_{\pi 2}$-based acceptance study results in comparison with '98.

– Beam Background Estimate

A preliminary beam background estimate was done based on the bifurcated studies.

1-Beam:

$$R_{\text{DELC}} = 4202 \quad (19893)$$

$$N_K = \frac{35/(10-1)}{(4202-1)} = 9.26 \times 10^{-4}$$

$$N_\pi = \frac{94/(434-1)}{(4202-1)} = 0.52 \times 10^{-4}$$

2-Beam:

$$R_{\text{BWTRS}*\text{CKTRS}*\text{CKTAIL}} = 86.5$$
$$R_{\text{BWTRS}*\text{CPITRS}*\text{CPITAIL}} = 4697$$

$$N_K = \frac{4/(77-1)}{(86.5-1)} = 6.16 \times 10^{-4}$$

$$N_\pi = \frac{126/(1094.5-1)}{(4697-1)} = 0.25 \times 10^{-4}$$

Background	01-02	98
BM1	0.0029	0.0039
BM2	0.0019	0.0004
Total	0.0048	0.0043

– Beam Backgrounds in Comparison with '98

- □ 1-BM $\downarrow$ though the B4DEDX rejection $\downarrow$

  $\Rightarrow$ DELC rejection $\downarrow$ but not much

  $R_{\mathrm{DELC}} \;=\; 4202\ (4769)$

  $\Rightarrow$ CK, CPITRS rejection $\uparrow$

  K-entering: $R_K \;=\; 10\ (5.25)$
  π-entering: $R_\pi \;=\; 434\ (56)$

  $\Rightarrow$ a new cut CNPE helps

  w/o CNPE: $R_{\mathrm{B4DEDX}} \;=\; 1.41\ (1.68)$
  w/ CNPE: $R_{\mathrm{B4DEDX*CNPE}} \;=\; 5.6$

  $N_K \;=\; 3.89\ (3.76) \qquad N_\pi \;=\; 0.22\ (1.49)$

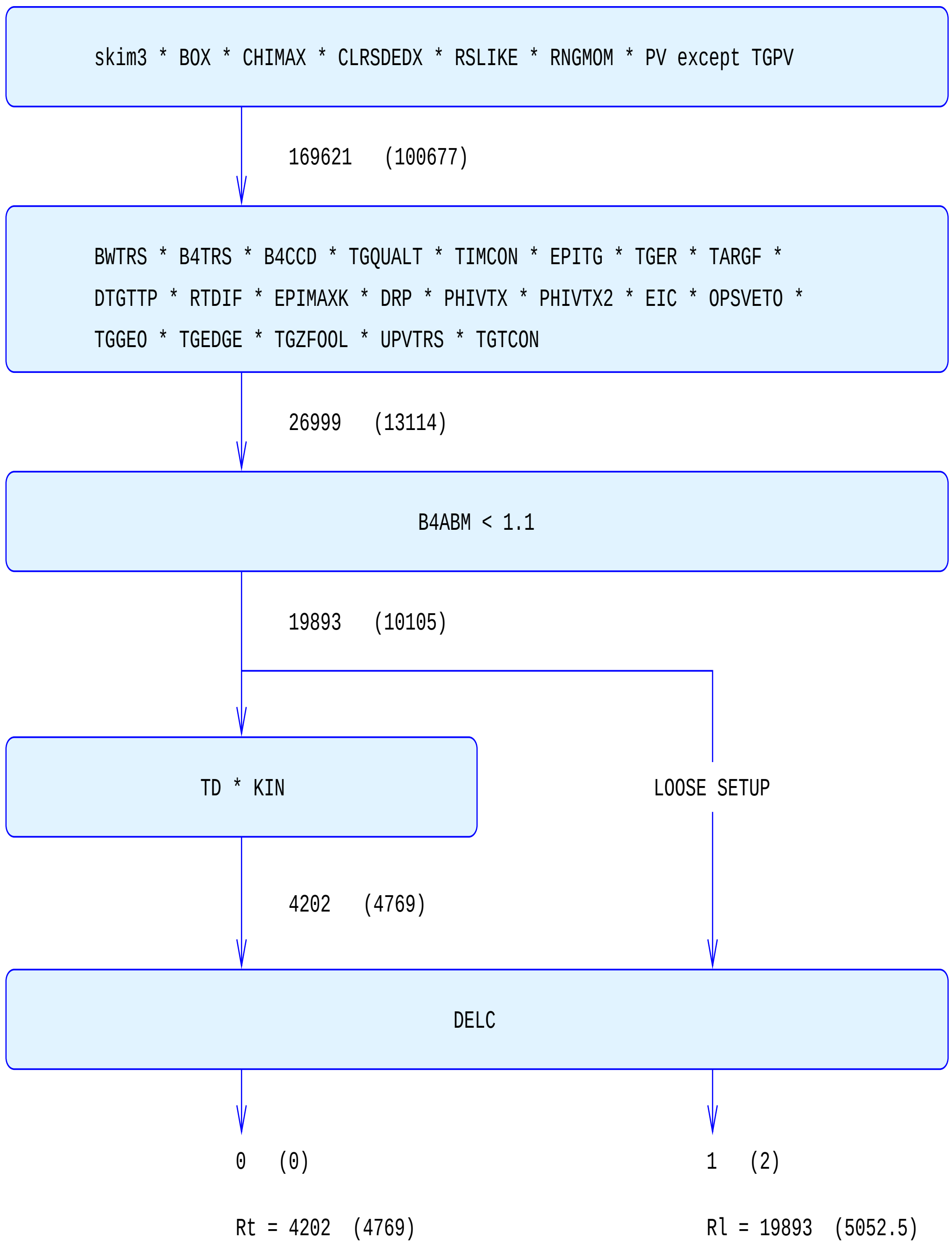
- □ 2-BM $\uparrow$

  $\Rightarrow$ K - K entering rejection $\downarrow$

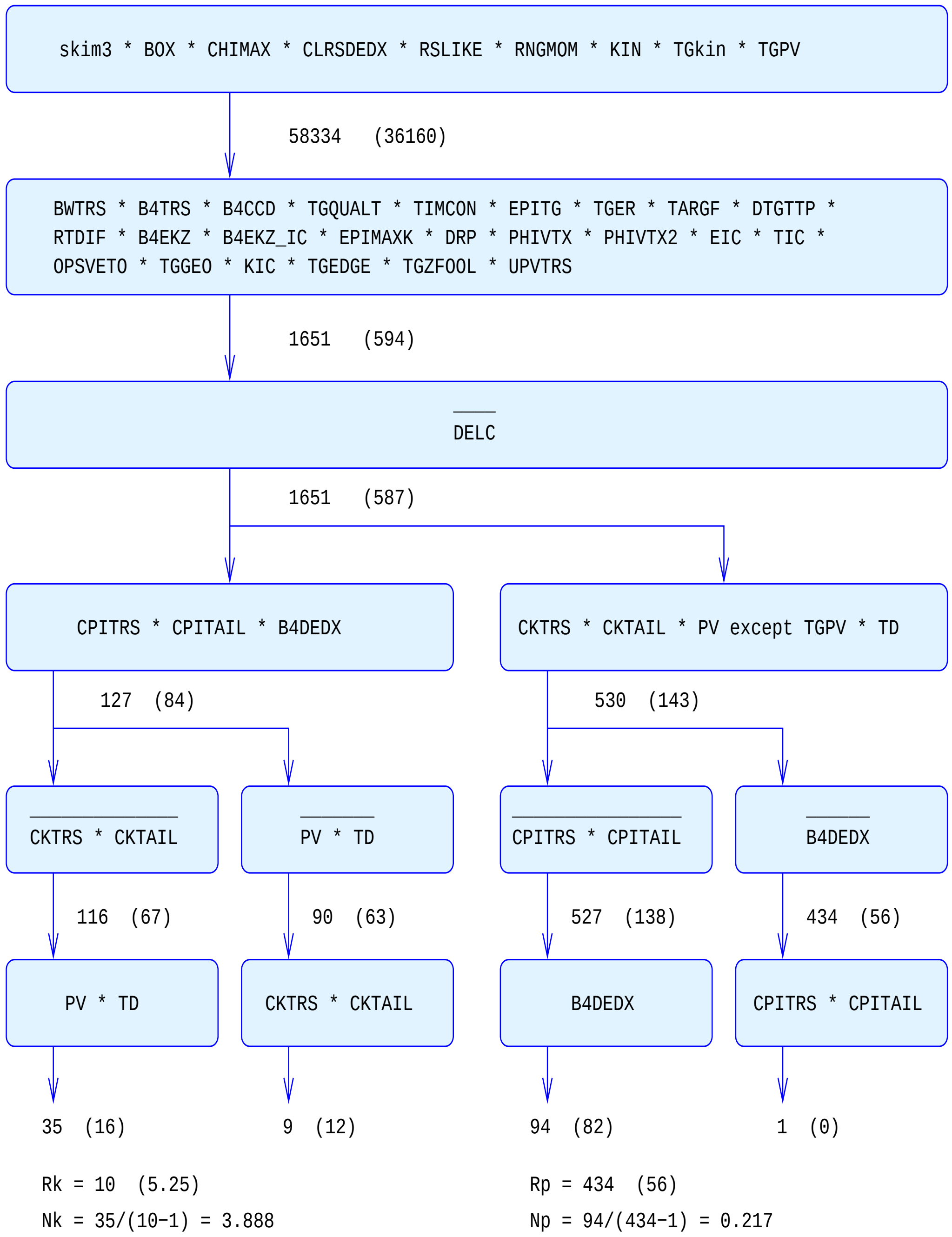
  $R_{\mathrm{BWTRS*CKTRS*CKTAIL}} \;=\; 86.5\ (113.7)$
  BWTRS loosened up because of small acceptance

  $N_{K-K} \;=\; 0.052\ (0.058) \qquad N_{K-\pi} \;=\; 0.12\ (0.016)$

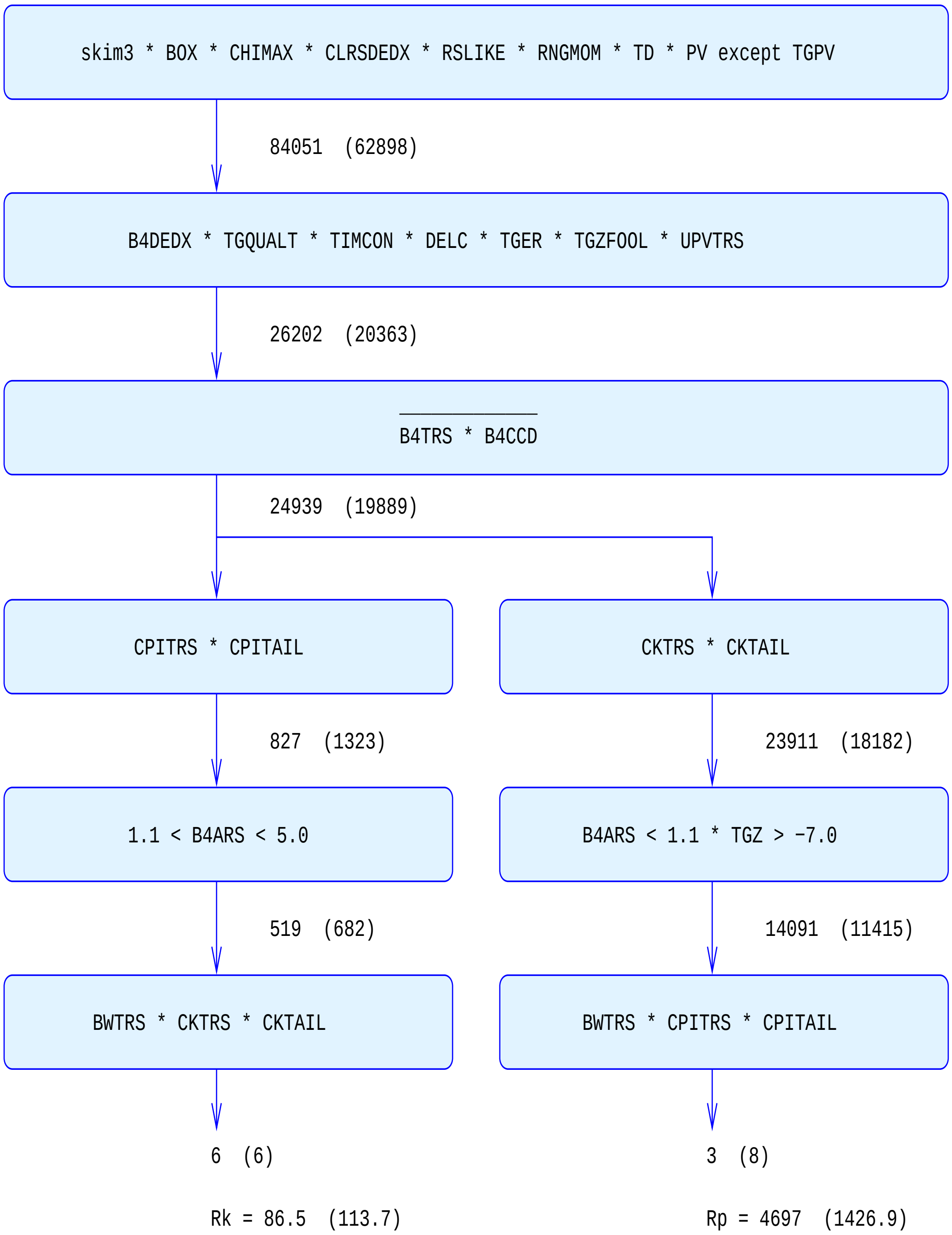
– Single Beam Rejection Branch



– Single Beam Normalization Branch



– Double Beam Rejection Branch



– Double Beam Normalization Branch