Weekly analysis meeting(BNL)
July 16, 2002
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# 1997 PNN2 Analysis.

- Some more properties of the two troubling events that we observed in the Kpi2-scatter(RS) background study:

- First Event:
  (a)
  Run: 35011; Event: 104631; iev: 187
  Ptot: 207.9854 Mev; ETOT: 80.513 Mev
  RTOT: 22.39 cm; trs: 10.69 ns; SLAY: 9
  abs(COS3d) = 0.0577 (dipangle measured by UTC:cut is at 0.5)
  abs(ZUTOUT) = 5.185 cm (Cuts on the Z position at the outside edge of the UTC: the cut is at 25 cm)
  chimax_rsdedx = 0.94819; cl_rsdedx = 0.2473 ( RSDEDX cut: cut event if chimax_rsdedx>= 5 ; cl_rsdedx.le.0.02)
  pr_rf = 1; pr_rfz2 = 0.0103 (CHIRF cut: the cut is at 0.01)
  utcqual_new = - 0.0549 (UTC likelihood based on no of xy and z hits and the number of hits in each superlayer; cut is at -5)
  chi_rm = -7.8516 (RNGMOM cut: cuts event if chi_rm.gt.2)

  (b) Photon Energy:
  This event recorded about 0.097 Mev of photon energy in the target. No photons were recorded anywhere else.
  (c) Electron finding:
  Electron was found at: telec = 312.762 ns
  dtelec = 0.342133 ns
  eelec1 = 321.377 feracounts = 20.08 Mev
  eelec2 = 360.453 feracounts = 22.53 Mev

- Second Event:
  (a)
  Run: 35095; Event: 23811; iev: 1863
  Ptot: 207.5458 Mev; ETOT: 89.377 Mev
  RTOT: 22.88 cm; trs: 9.032 ns; SLAY: 9
  abs(COS3d) = 0.2082 (dipangle measured by UTC:cut is at 0.5)
  abs(ZUTOUT) = 12.818 cm (Cuts on the Z position at the outside edge of the UTC: the cut is at 25 cm)
  chimax_rsdedx = 2.766; cl_rsdedx = 0.0635 ( RSDEDX cut: cut event if chimax_rsdedx>= 5 ; cl_rsdedx.le.0.02)
  pr_rf = 0.6322; pr_rfz2 = 0.84022 (CHIRF cut: the cut is at 0.01)
  utcqual_new = - 2.899 (UTC likelihood based on no of xy and z hits and the number of hits in each superlayer; cut is at -5)
  chi_rm = -7.7135 (RNGMOM cut: cuts event if chi_rm.gt.2)

  (b) Photon Energy:
  No visible photons were recorded anywhere .

  (c) Electron finding:
  Electron was found at:
  telec = 1783.09 ns
  dtelec = 0.5376 ns
  eelec1 = 169.957 feracounts = 10.6 Mev
  eelec2 = 470.354 feracounts = 29.4 Mev

- Comment on the two events:

  a) Note from TN-338(1997 PASS1 summary): The following runs were affected by the TT HV problem :

  RUNS : 34971-2, 34978-9, 34985-7, 34989-90, 35003-7,35011,35015-6,35034,35169.

  Other potential problems exist for RUNS: 34474, 34509, 34549, 34707, 34795, 35148 and 35247.

  b) Looks like the first event (Run 35011; Event:104631) was a very unlucky Kpi2 scatter(target) event. With half of the target off, the photon must have escaped detection in the target. Note that for this event one of the target fibers recorded 0.097 Mev of intime photon energy. The stopping counter in the RS recorded a very nice $\pi \rightarrow \mu$ decay. The kb/ck for this run was found to be 0.2673.

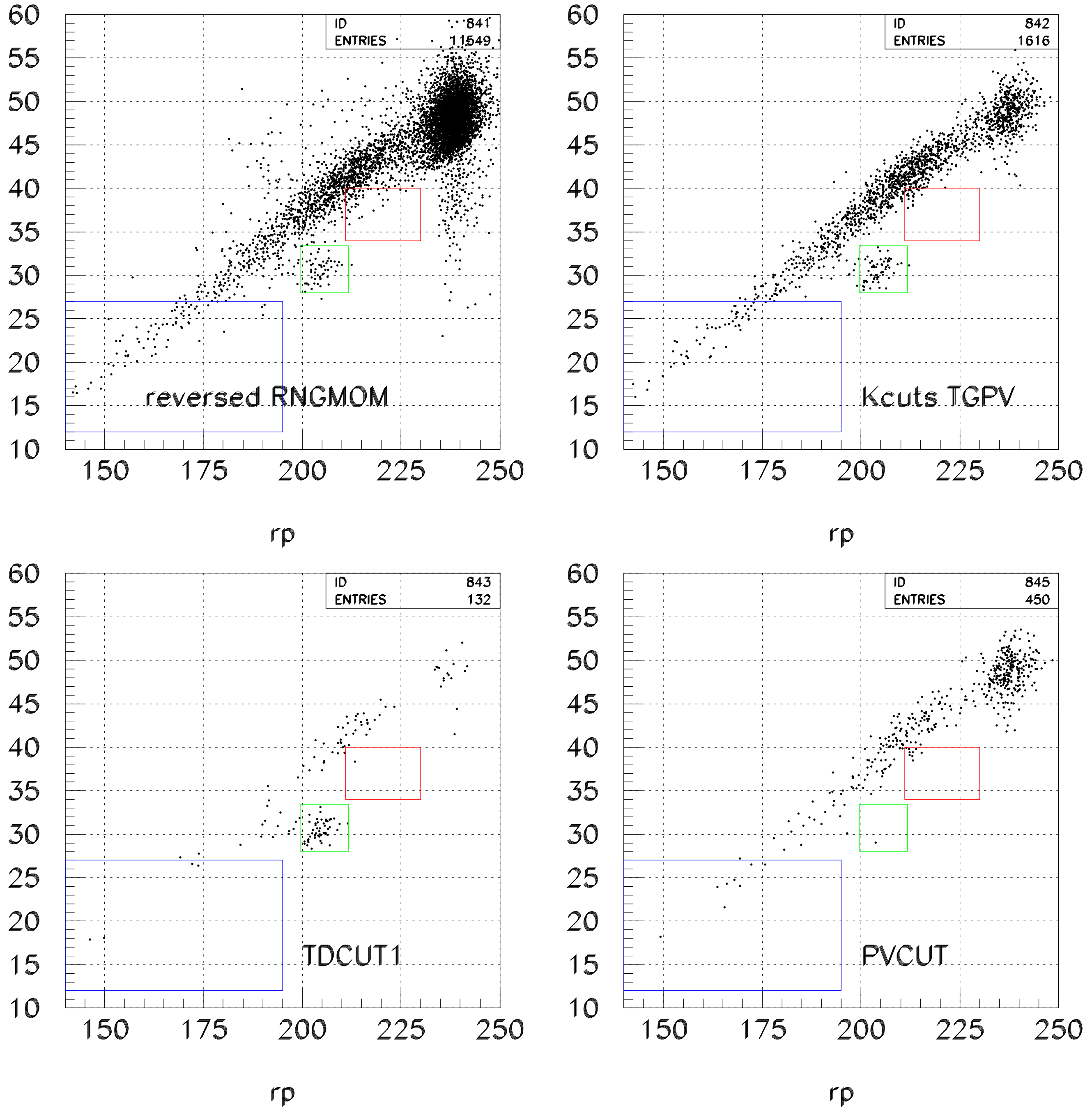
  c) The second event (Run: 35095; Event: 23811) is not in the TT HV problem list and that's why it is still a mystery. As mentioned above, this event has very good UTC and RS track fitting. The stopping counter in RS recorded a very early muon (at 5.16 ns). It is not clear whether this second pulse is coming from some tail fluctuation or really from early pion decay. Electron was found at 1783.09 ns with about 40 Mev energy. For this run the kb/ck was found to be 0.2715.

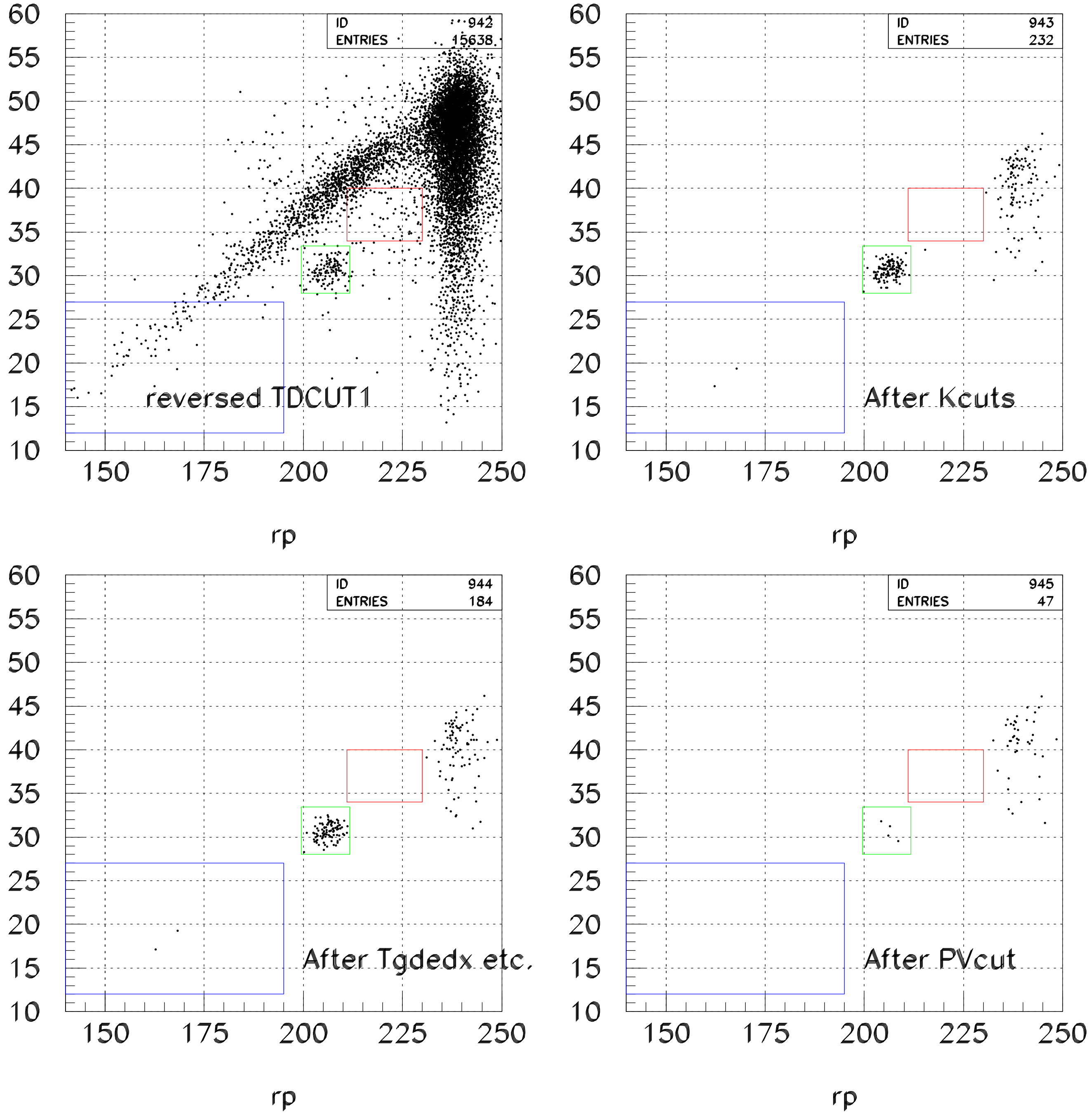
# Muon background

- Muon background is assumed to come from radiative Kmu2 decay ($K^+ \to \mu\nu\gamma$) and Kmu3 decay ($K^+ \to \mu^+\pi^0\nu$) and is expected to be small.

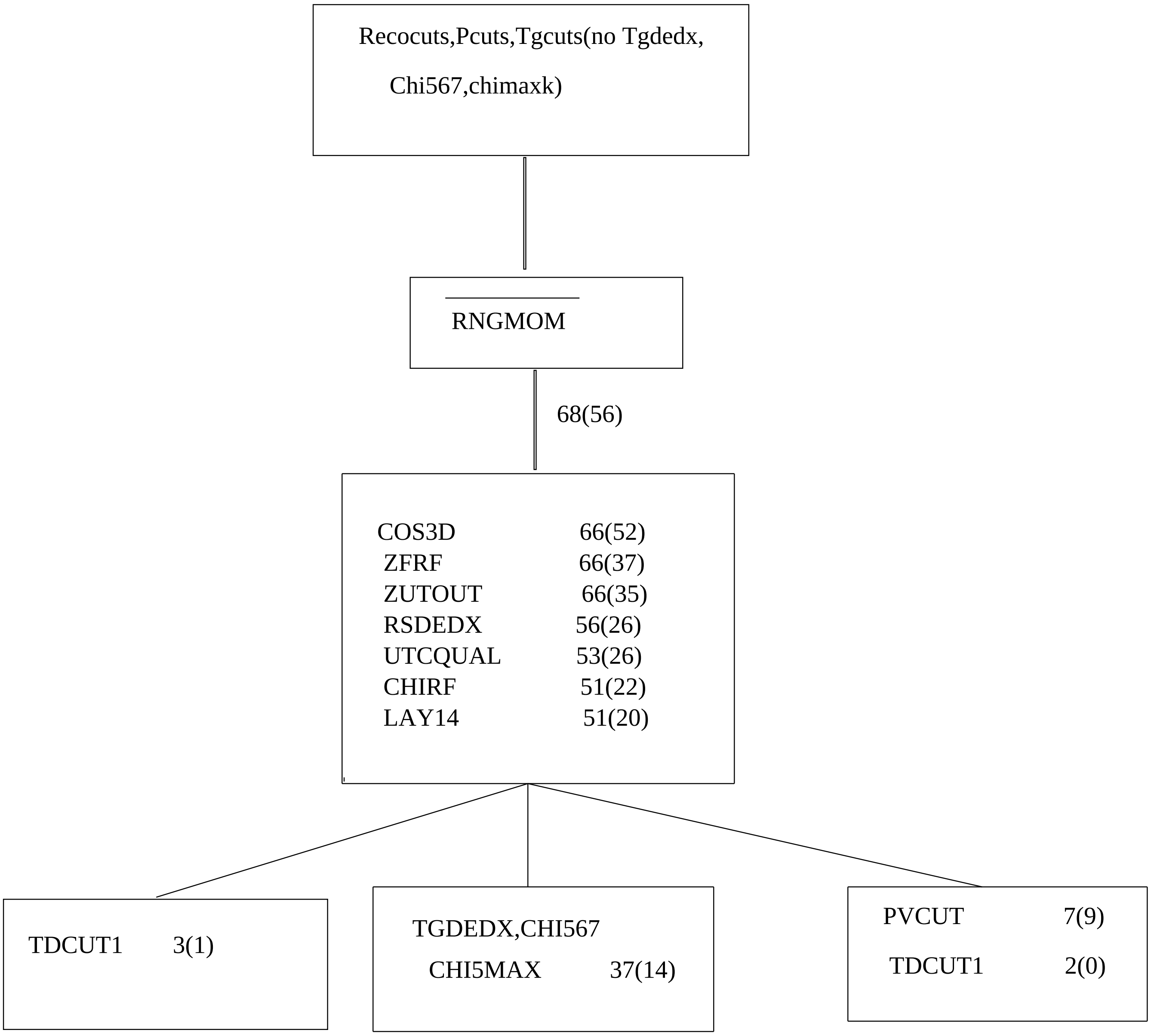
- Event sample in the rejection branch was selected by reversing the RNGMOM cut and the events in the normalisation branch was selected by reversing TDCUT1.

- TGDEDX,CHI567 and CHI5MAX were found have small muon rejection.

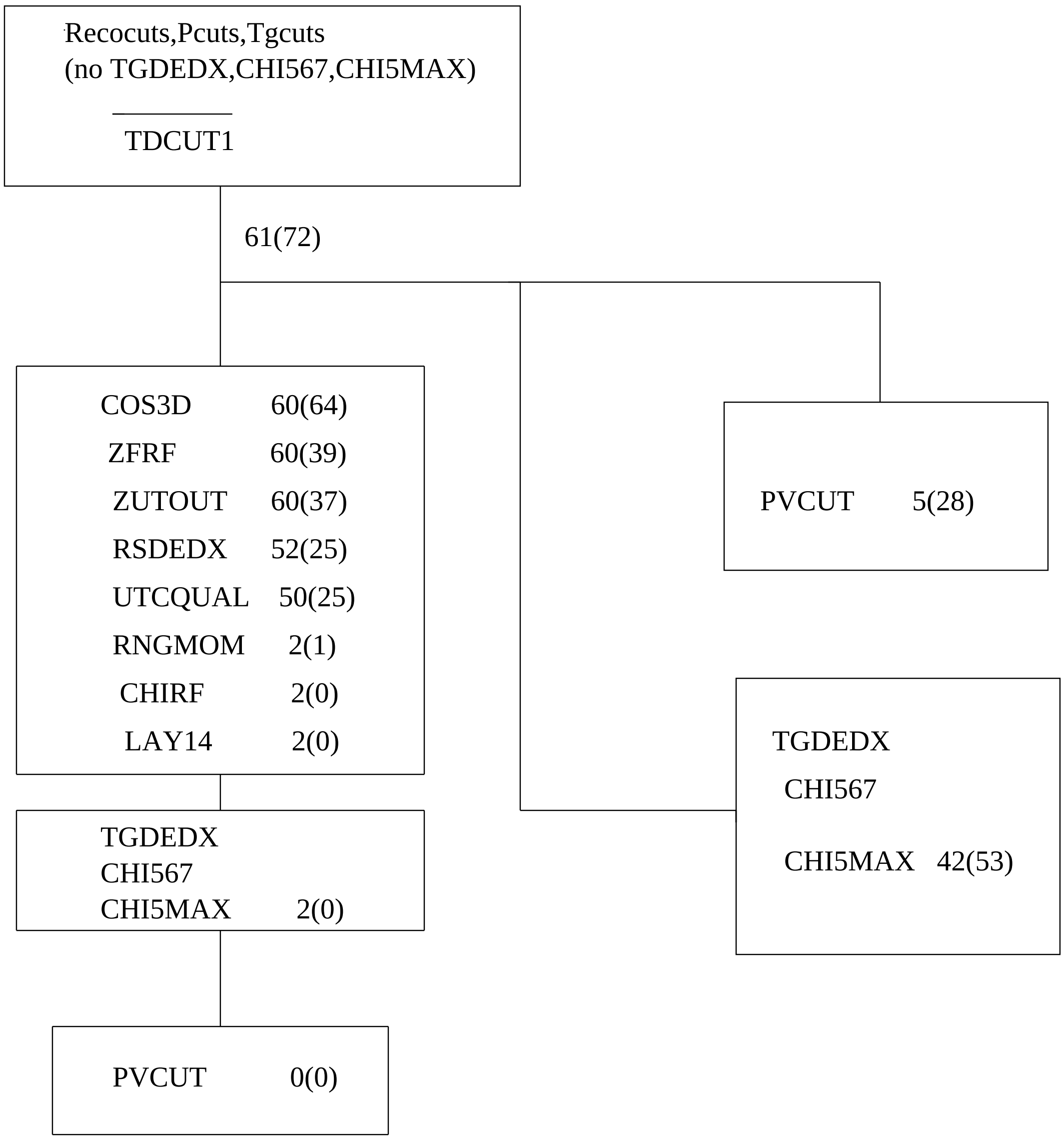

ID 841
ENTRIES 11549
reversed RNGMOM
rp
ID 842
ENTRIES 1616
Kcuts TGPV
rp
ID 843
ENTRIES 132
TDCUT1
rp
ID 845
ENTRIES 450
PVCUT
rp


ID 942
ENTRIES 15638
reversed TDCUT1
rp
ID 943
ENTRIES 232
After Kcuts
rp
ID 944
ENTRIES 184
After Tgdedx etc.
rp
ID 945
ENTRIES 47
After PVcut
rp

a)Study of muon background with 2/3 sample:(Rejection Branch)



A)Study of muon background with 1/3 sample (Normalization Branch):



- Muon Background Calculation:
  $R_{TD} = 51/3 = 17 \pm 9.5$
  $R_{PV_\mu} = 51/7 = 7.3 \pm 2.6$
  $R_{TG_\mu} = 51/37 = 1.38 \pm 0.12$
  There were no events left in the normalisation branch after the PV-CUT.
  Therefor the muon background from the 1/3 smaple is calculated to be:
  $N_{BCK_\mu} = (1 \pm 1) \times 3/((R_{TD}\text{-}1) R_{PV_\mu}\ R_{TG_\mu}) = 0.019 \pm 0.019$
- In 1996 PNN2 analysis the muon background was calculated to be:

  $N_{BCK_\mu} = 0.011 \pm 0.011$ from the 1/3 sanple

  $N_{BCK_\mu} = 0.007 \pm 0.007$ from the 2/3 sanple

- Correlation of PV cuts with TDCUT1:

  The Photon Veto rejection in the RNGMOM reverse sample was measured to be : $7.3 \pm 2.6$

  And the Photon Veto rejection in the TDCUT1 reversed sample was measured to be : $12.2 \pm 5.2$

  It looks like there is some correlation exists between TDCUT1 and Photon Veto cuts. However, it is hard to derive any conclusion from the above numbers, as they are still limited by statistics. Therefore in our muon background estimate, we assumed that even if there is some correlation exists between TDCUT1 and Photon Veto cuts, that correlation is small.

  There is no correlation found between TDCUT1 and TGDEDX, CHI567, CHI5MAX cuts.