# Muon bacground in PNN2 data analyses.

**Dmitri I. Patalakha**

**October 26, 2006**

The PNN2_SKIM set of 2002 data taking run has been used in this analysis. The total statistics in this set is 30.995.248 events. Cuts for muon background in PNN2 1996 data were taken of Bipul Bhuyan's thesis but were updated (see comment on it below).

| Cut name | Number of events for trigger type after cut | |
|---|---|---|
| | PNN 1 | PNN 2 |
| COUNTER | 20950236( 1.0000) | 15577875( 1.0000) |
| BAD_RUN | 20593958( 1.0173) | 15232203( 1.0227) |
| FIX_ALL | 20593958( 1.0000) | 15232203( 1.0000) |
| BOX_PNN | 875790( 23.5147) | 4429035( 3.4392) |

**Table 1: The general run rejection branch cuts.**

**FIX_ALL means : fix_all(2.) for PNN1 and fix_all(0.) for PNN2.**
**BOX_PNN means : BOXCUTS for PNN1 and BOX2 for PNN2.**

| Cut name | Number of events for trigger type after cut | |
|---|---|---|
| | PNN 1 | PNN 2 |
| B4DEDX | 527462( 1.6604) | 3622078( 1.2228) |
| BWTRS | 241988( 2.1797) | 2100356( 1.7245) |
| B4TRS | 204853( 1.1813) | 1766986( 1.1887) |
| B4CCD | 203632( 1.0060) | 1751053( 1.0091) |
| CKTRS | 145507( 1.3995) | 905901( 1.9329) |
| CPITRS | 49288( 2.9522) | 754507( 1.2006) |
| TIMCON | 41166( 1.1973) | 613057( 1.2307) |
| PCUTS | 41166( 21.2746) | 613057( 7.2245) |

**Table 2: The PCUTS rejection branch cuts.**

| Cut name | Number of events for trigger type after cut | |
|---|---|---|
| | PNN 1 | PNN 2 |
| B4TIM | 33551( 1.2270) | 488593( 1.2547) |
| B4EKZ | 22793( 1.4720) | 323681( 1.5095) |
| B4EKZ_IC | 22793( 1.0000) | 323681( 1.0000) |
| TGZFOOL | 22793( 1.0000) | 323681( 1.0000) |
| EPITG | 22480( 1.0139) | 304430( 1.0632) |
| EPIMAXK | 21642( 1.0387) | 287077( 1.0604) |
| TGER | 21485( 1.0073) | 283385( 1.0130) |
| TARGF | 20030( 1.0726) | 251838( 1.1253) |
| DTGTTP | 20022( 1.0004) | 251614( 1.0009) |
| RTDIF | 19775( 1.0125) | 247854( 1.0152) |
| DRP | 19710( 1.0033) | 242562( 1.0218) |
| TGKTIM | 18297( 1.0772) | 201552( 1.2035) |
| EIC | 17123( 1.0686) | 183421( 1.0989) |
| TIC | 17107( 1.0009) | 183303( 1.0006) |
| TGEDGE | 16830( 1.0165) | 174072( 1.0530) |
| TGENR | 16018( 1.0507) | 159118( 1.0940) |
| PIGAP | 15829( 1.0119) | 156660( 1.0157) |
| TGLIKE | 14544( 1.0883) | 141435( 1.1077) |
| TGB4 | 13701( 1.0615) | 131315( 1.0771) |
| PHIVTX | 13124( 1.0440) | 104938( 1.2514) |
| OPSVETO | 12792( 1.0259) | 89214( 1.1763) |
| TGPVCUT | 12440( 1.0283) | 78642( 1.1344) |
| TIMKF | 10290( 1.2089) | 62910( 1.2501) |
| CCDPUL | 3791( 2.7143) | 19923( 3.1577) |
| DELCO6 | 3456( 1.0969) | 17755( 1.1221) |
| NPITG | 3456( 1.0000) | 17755( 1.0000) |
| VERRNG | 3169( 1.0906) | 15823( 1.1221) |
| ANGLI | 3165( 1.0013) | 15802( 1.0013) |
| ALLKFIT | 2949( 1.0733) | 14479( 1.0914) |
| TPICS | 2495( 1.1820) | 12716( 1.1386) |
| KIC | 2480( 1.0061) | 12649( 1.0053) |
| PIONK | 2475( 1.0020) | 12627( 1.0017) |
| TGCUTS | 2475( 16.6327) | 12627( 48.5513) |

**Table 3: The TGCUTS rejection branch cuts.**

| Cut name | Number of events for trigger type after cut | |
|---|---|---|
| | PNN 1 | PNN 2 |
| -RNGMOM | 1791( 1.3819) | 11460( 1.1018) |
| COS3D | 1721( 1.0407) | 11160( 1.0269) |
| ZFRF | 1413( 1.2180) | 11148( 1.0011) |
| ZUTOUT | 1411( 1.0014) | 11134( 1.0013) |
| RSDEDX | 773( 1.8254) | 7030( 1.5838) |
| UTCQUAL | 635( 1.2173) | 5671( 1.2396) |
| PRRF | 338( 1.8787) | 5140( 1.1033) |
| SETUP | 338( 7.3225) | 5140( 2.4566) |

**Table 4: The SETUP rejection branch cuts.**

| Cut name | Number of events for trigger type after cut | |
|---|---|---|
| | PNN 1 | PNN 2 |
| LAYV4NN1 | 338( 1.0000) | 5140( 1.0000) |
| IPIFLG | 162( 2.0864) | 3043( 1.6891) |
| EV5 | 83( 1.9518) | 1630( 1.8669) |
| ELVETO | 52( 1.5961) | 876( 1.8607) |
| TDFOOL | 52( 1.0000) | 871( 1.0057) |
| TDVARNN | 0(9999.8900) | 20( 43.5500) |
| TDCUT | 0(9999.8900) | 20( 257.0000) |
| ALL_CUTS | 0( 20950236) | 20( 15232203) |

Table 5: The TDCUT rejection branch cuts.

In Tables 2,3,4,5 are listed the cut names in rejection branch.
B.Bhuyan for the 1996 data set used alike rejection branch. It turned out that the meaning of "composite" cuts and sometimes the name of "basic" cuts have been changed from 1996 and what is more the cut constants has to be adjusted properly. Changes in cuts of Bipul Bhuyan's thesis :

I). PCUTS rejection branch:

1). B4TD changed to B4CCD

2). BHTRS doesn't exist more.

3). TIMCON-TPI and TIMCON-TK substituted by TIMCON.

II). TGCUTS rejection branch:

1). EPIMAX changed to EPIMAK

2). PBG doesn't exist more.

III). TDCUT1 rejection branch:

1). PROBTD doesn't exist more and could be substituted by ntuple variable with the same name and is still used in /home/e949/pass2/02/anal/func/tdcut1.function → if(probtd.lt.0.01) tdcut1 =0.

2). TAIL_F doesn't exist more from 1998 March and was replaced by TDDFA1 and TDDFA2 (different value of dfa1min - 4.2 and 2.6).

Table from technote K034:

| Cut name | Rejection | | | | Acceptance |
|---|---|---|---|---|---|
| | Range tail | | Band | | |
| | All | ER box | All | ER box | |
| **SETUP** | 65712(-) | 20292(-) | 40383(-) | 17976(-) | 192647(-) |
| **EV5** | 31432(2.09) | 9453(2.15) | 19926(2.03) | 9081(1.98) | 160853(0.835) |
| **ELVETO** | 18603(1.69) | 5510(1.72) | 11335(1.76) | 5115(1.78) | 150361(0.938) |
| **TDFOOL** | 18508(1.01) | 5478(1.01) | 11283(1.00) | 5096(1.00) | 150098(0.998) |
| **TDVAR** | 137(135±11) | 51(107±15) | 75(150±17) | 34(150±26) | 127016(0.846) |
| **Rej.** | 480±41 | 398±56 | 539±62 | 529±91 | 0.659±0.001 |

**Table 6: Rejection branch and acceptance of the 2002 TD cuts using 2/3 sample**

**For range tail events** $R_{TD} = 480. \pm 41$.
**B.Bhuyan for the 1996 data set had number of event after :**
**LAY14 cut - 151**
**LAY14 and TDCUT1 cuts - 5**
**LAY14 and PVCUT cuts - 16.**
**So he had**
$R_{TD} = \frac{151}{5} = 30.2 \pm 13.7$
$R_{PV} = \frac{151}{16} = 9.4$
$R_{\mu} = R_{TD} \cdot R_{PV} = 285$. **IPIFLG was applied at PASS1 stage.**
**In our rejection branch we have :**
$R_{TD} = \frac{3043}{20} = 152.2 \pm 34.1$
**i.e in 5 times more that B.Bruyan and 3 times less than k034, but PVCUT cut wasn't apllied yet.**
**(But all these are in range of about 3 standart deviation .)**
**Is it supposed that TDCUT comprise EV5 ELVETO TDFOOL TDVARNN cuts ?**