The Downstream Photon Veto

Ilektra A. Christidi, Stony Brook

February 1, 2007

Abstract

Some photon activity in the DSPV is shown in this note, and the gain in rejection over acceptance loss from a PV cut is explored.

For the measurement of the rejection, the 13 classes of Kp2 events that scatter in the target, that were used to measure the background (rejection branch), are used [1]. In those classes, all the KCUTS, PSCUTS and PVCUT are applied, and some of the TGCUTS are inverted in the PNN2BOX. In class 1, all the TGCUTS are applied, but the kinematics are in the KP2BOX. For the acceptance, the Km2 sample used for the measurement of the Km2-based PV acceptance is used, after all other PV [1]. The results for all the classes are shown in table 1, and the time vs energy plots for class 12 and the acceptance sample in fig. 1 and 2 respectively. The plots for the rest of the classes are in `http://www.phy.bnl.gov/e949/software/meetings/bnl/23jan07/dspv_classes1.ps` For the energy sums, the energies of hits in the DSPV between (-5,10)ns from trs are summed, based on the prompt peak shown in the time plots for the 13 classes. The energies in these plots are the pedestal-subtracted ADC counts and the times are with respect to trs (TOF calibrated out). The plots were also done for the KP2BOX without any TGCUTS applied, in an attempt to see a prompt peak with more statistics, but, as shown in the tables, there is almost no activity in the DSPV for Kp2 peak events, even without any TGCUTS.

In order to check for correlations with the other PV subdetectors, the study was repeated with the EC (except for the US inner ring), TG and CO turned off. The results are shown in table 2 and fig. 3 and 4 for class 12 and km2s respectively. The rest of the classes are plotted in `http://www.phy.bnl.gov/e949/software/meetings/bnl/23jan07/dspv_classes_noDSpvs1.ps` . The same study for only the TG and CM turned off is shown in table 3, and the plots are in `http://www.phy.bnl.gov/e949/software/meetings/bnl/23jan07/dspv_noCMTG.ps` . Finally, the same study for all the TG (both the analysis cut and the skim level cut TGPVCUT), the VC and CM turned off is shown in table 4 and fig. 5, and the rest of the plots are in `http://www.phy.bnl.gov/e949/software/meetings/bnl/30jan07/dspv_classes_noTG1VCCM.ps` .

It seems that the DSPV is not correlated with the other PVs close to the beam, and the 12.5% rejection that it has for class 12 is a pure gain in rejection. Only the same 2 events with activity in the DSPV show up when the rest of the PVs are turned off. When TGPVCUT is also not applied, 3 times more events show up in the DSPV, which is expected, but its rejection remains at the few percent level.

Given that the loss in acceptance is negligible, a DSPV cut with time window of (-5,10)ns and energy threshold of 0 will be used in the PNN2 PV cut.

CLASS	events before DSPV	events w/ DSPV energy	DSPV hits	rej or acc
1 (KP2BOX)	26	0	0	1
no TGCUTS (KP2BOX)	389	1	1	1.003
2 (PNN2BOX)	18	2	6	1.125
3 (PNN2BOX)	2	0	0	1
4 (PNN2BOX)	3	0	0	1
5 (PNN2BOX)	20	2	6	1.111
6 (PNN2BOX)	2	0	0	1
7 (PNN2BOX)	17	2	8	1.133
8 (PNN2BOX)	0	0	0	1
9 (PNN2BOX)	17	2	6	1.133
10 (PNN2BOX)	8	2	6	1.333
11 (PNN2BOX)	0	0	0	1
12 (PNN2BOX)	18	2	6	1.125
13 (PNN2BOX)	2	0	0	1
acc (KM2BOX)	20883	2	44	0.9999

Table 1: The number of events that survive in every class before the application of the DSPV, number of events with non-zero energy in the DSPV in the time interval of (-5,10)ns, total number of non-zero hits and rejection of the cut. The same are also given for the acceptance sample. All the other PV cuts have been applied at PNN2 level.

References

[1] http://www.phy.bnl.gov/e949/restricted/theses/ilektra_christidi_thesis.pdf

CLASS	events before DSPV	events w/ DSPV energy	DSPV hits	rej or acc
1 (KP2BOX)	273	0	0	1
no TGCUTS (KP2BOX)	4625	5	15	1.001
2 (PNN2BOX)	2266	18	52	1.008
3 (PNN2BOX)	130	2	8	1.016
4 (PNN2BOX)	252	2	6	1.008
5 (PNN2BOX)	2642	20	58	1.008
6 (PNN2BOX)	209	2	8	1.010
7 (PNN2BOX)	3085	24	69	1.008
8 (PNN2BOX)	9	0	0	1
9 (PNN2BOX)	2103	16	45	1.008
10 (PNN2BOX)	1385	15	45	1.011
11 (PNN2BOX)	2	0	0	1
12 (PNN2BOX)	2398	18	52	1.008
13 (PNN2BOX)	164	3	10	1.019
acc (KM2BOX)	24545	2	66	0.9999

Table 2: The number of events that survive in every class before the application of the DSPV, number of events with non-zero energy in the DSPV in the time interval of (-5,10)ns, total number of non-zero hits and rejection of the cut. All the other PV cuts except for the EC, TG and CO have been applied at PNN2 level.

CLASS	events before DSPV	events w/ DSPV energy	DSPV hits	rej or acc
no TGCUTS (KP2BOX)	779	3	5	1.004
2 (PNN2BOX)	60	2	6	1.03
3 (PNN2BOX)	2	0	0	1
4 (PNN2BOX)	7	0	0	1
5 (PNN2BOX)	72	2	6	1.03
6 (PNN2BOX)	2	0	0	1
7 (PNN2BOX)	82	2	8	1.03
8 (PNN2BOX)	0	0	0	1
9 (PNN2BOX)	62	2	6	1.03
10 (PNN2BOX)	31	2	6	1.07
11 (PNN2BOX)	0	0	0	1
12 (PNN2BOX)	63	2	6	1.03
13 (PNN2BOX)	2	0	0	1
acc (KM2BOX)	20267	2	41	0.9999

Table 3: The number of events that survive in every class before the application of the DSPV, number of events with non-zero energy in the DSPV in the time interval of (-5,10)ns, total number of non-zero hits and rejection of the cut. All the other PV cuts except for the TG and CM have been applied at PNN2 level.

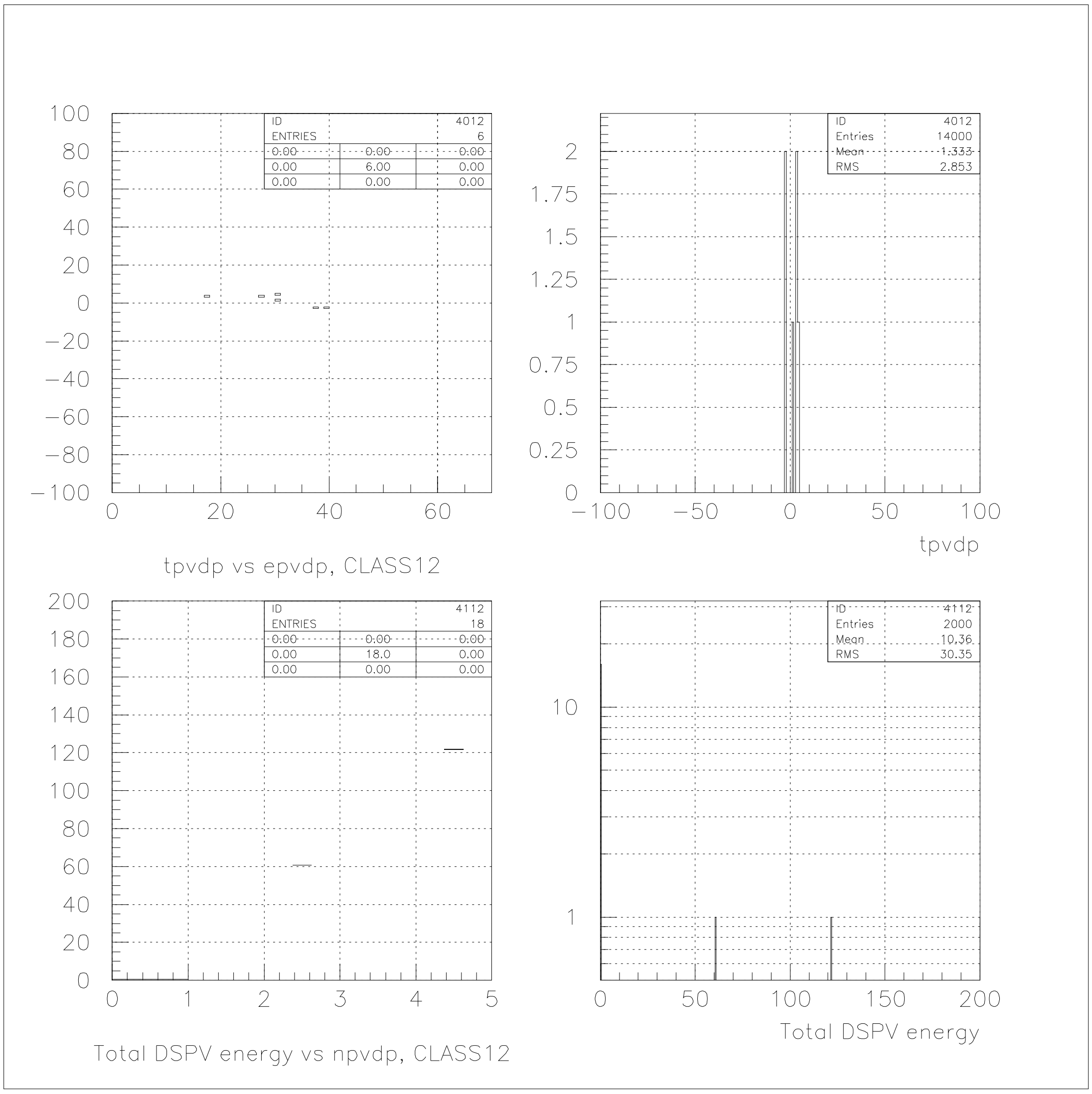

Figure 1: Time vs energy of DSPV hits (top left), time of DSPV hits (top right), total DSPV energy vs number of DSPV hits per event (bottom left) and total DSPV energy (bottom right) for class 12 (rejection sample). All the other PV cuts have been applied at PNN2 level.

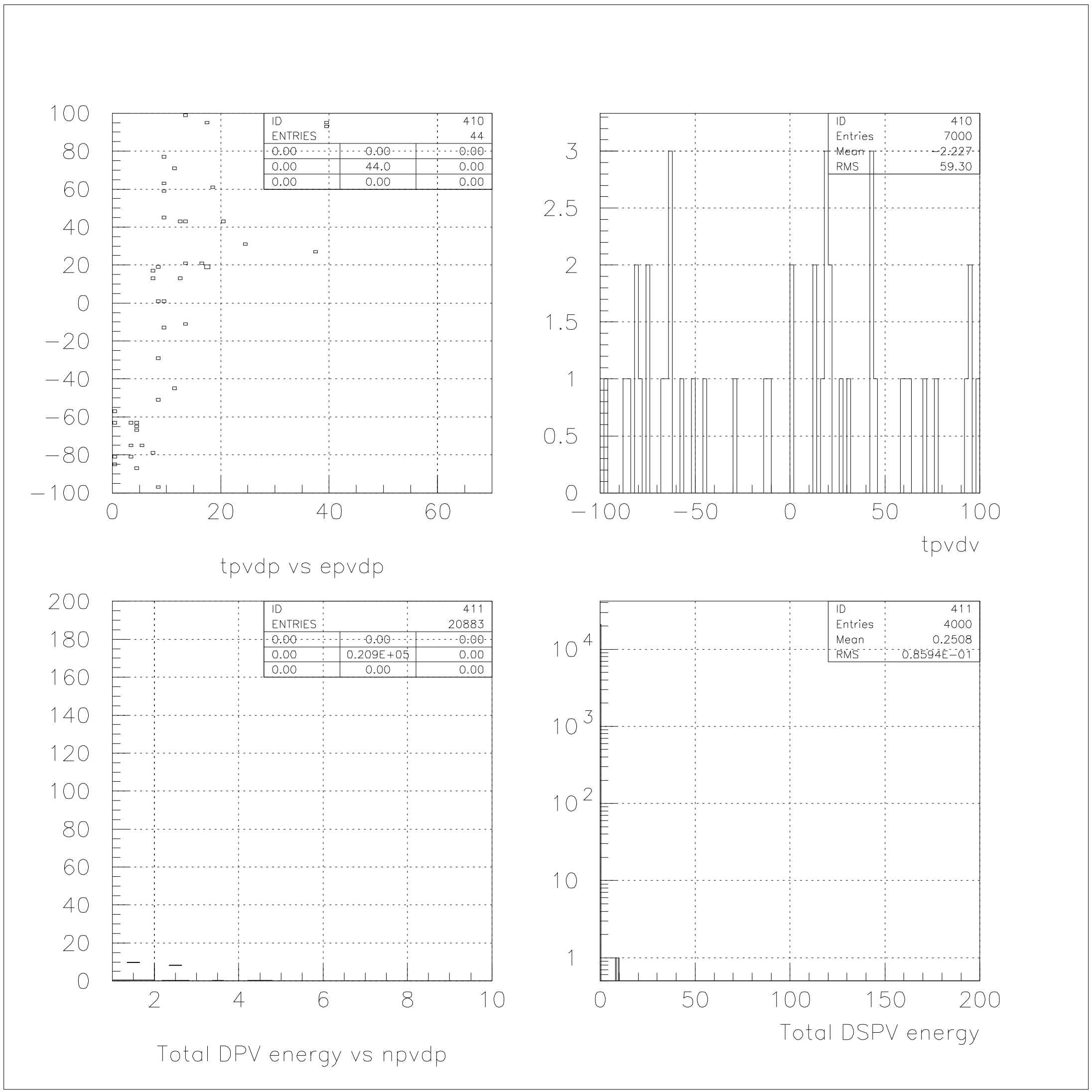

Figure 2: Time vs energy of DSPV hits (top left), time of DSPV hits (top right), total DSPV energy vs number of DSPV hits per event (bototm left) and total DSPV energy (bottom right) for km2s (acceptance sample). All the other PV cuts have been applied at PNN2 level.

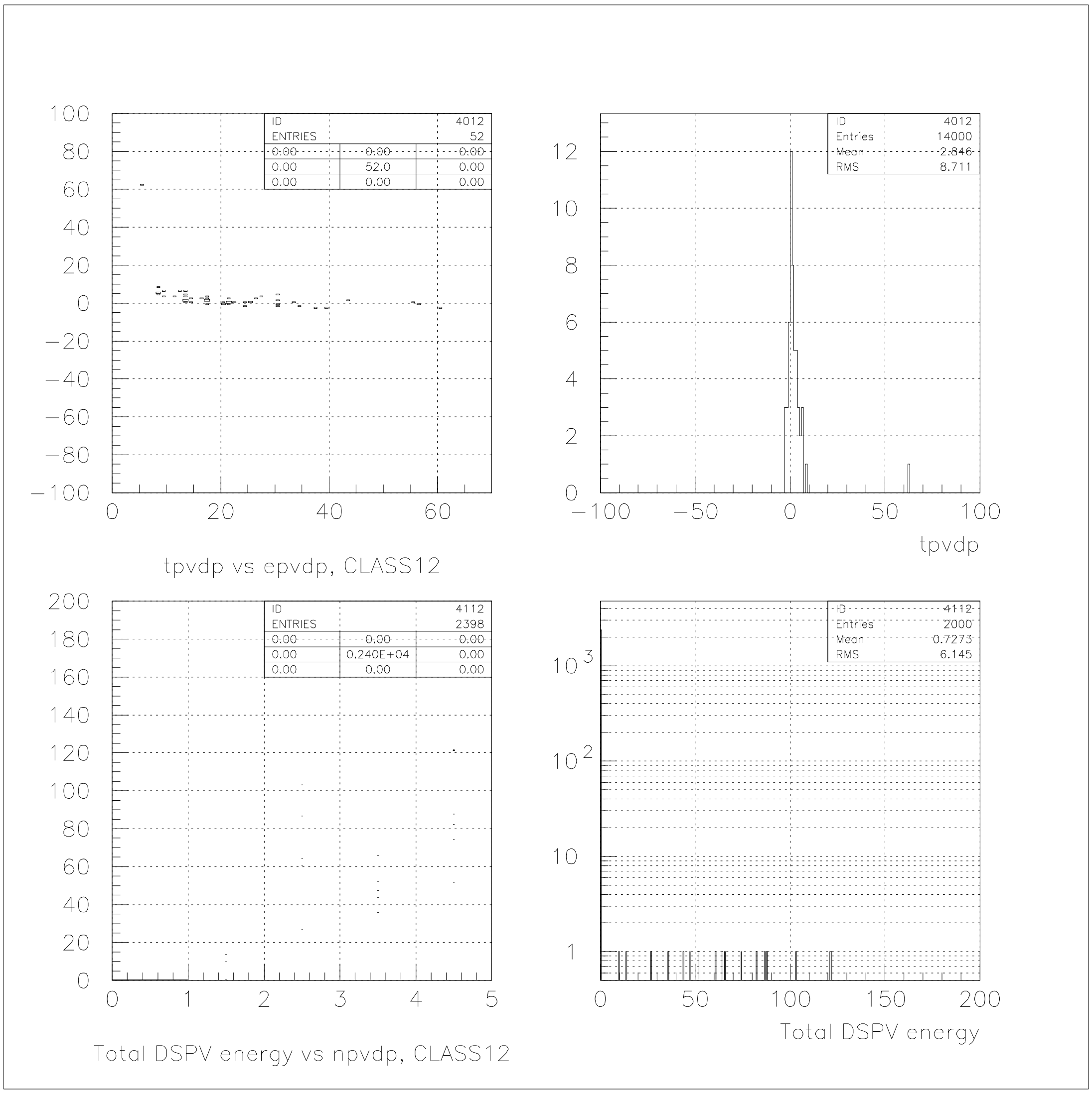

Figure 3: Time vs energy of DSPV hits (top left), time of DSPV hits (top right), total DSPV energy vs number of DSPV hits per event (bottom left) and total DSPV energy (bottom right) for class 12 (rejection sample). All the other PV cuts except for the EC, TG and CO have been applied at PNN2 level.

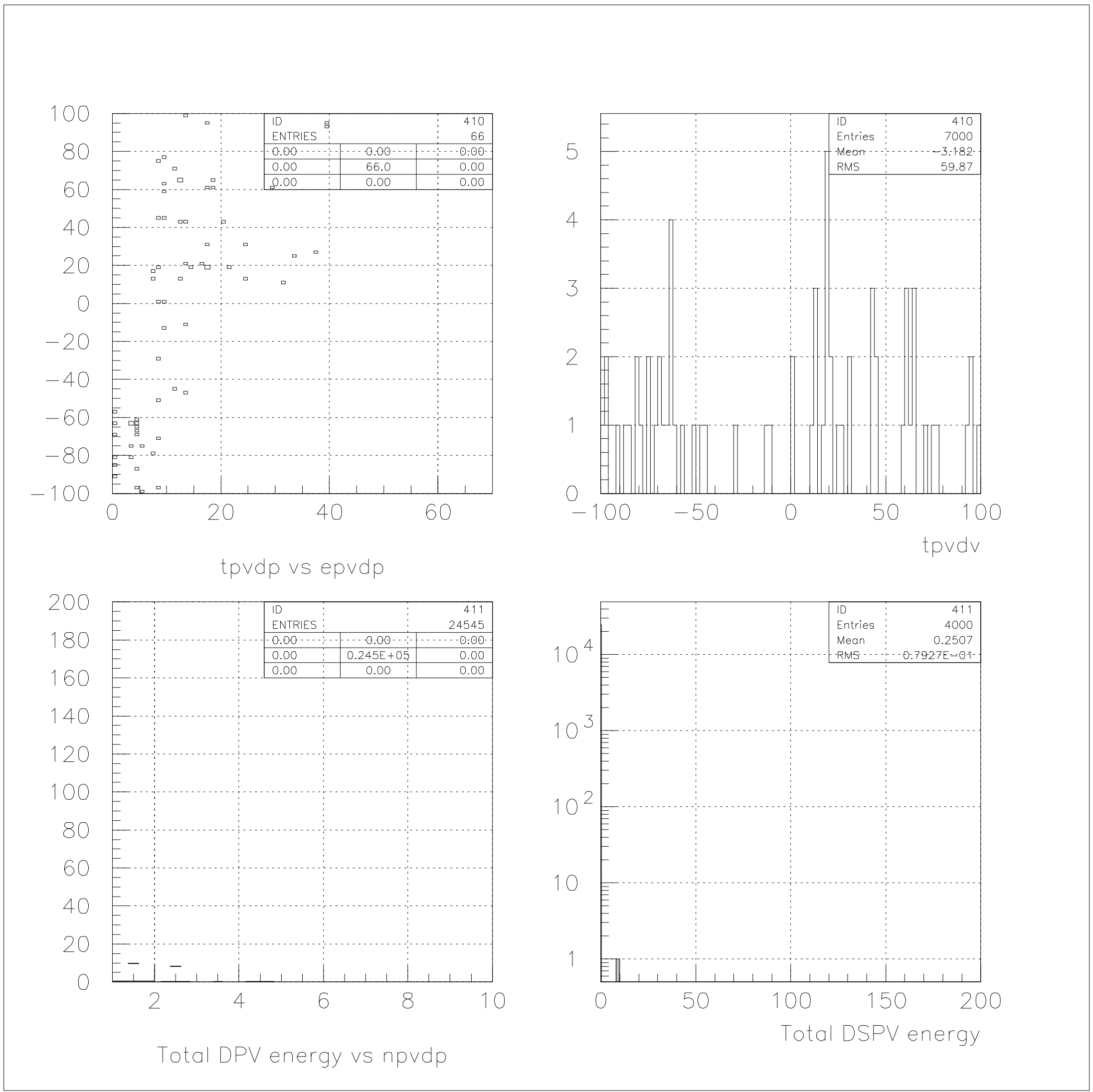

Figure 4: Time vs energy of DSPV hits (top left), time of DSPV hits (top right), total DSPV energy vs number of DSPV hits per event (bottom left) and total DSPV energy (bottom right) for km2s (acceptance sample). All the other PV cuts except for the EC, TG and CO have been applied at PNN2 level.

CLASS	events before DSPV	events w/ DSPV energy	DSPV hits	rej or acc
no TGCUTS (KP2BOX)	2025	4	7	1.002
2 (PNN2BOX)	326	6	14	1.02
3 (PNN2BOX)	2	0	0	1
4 (PNN2BOX)	18	0	0	1
5 (PNN2BOX)	360	6	14	1.02
6 (PNN2BOX)	2	0	0	1
7 (PNN2BOX)	411	6	21	1.01
8 (PNN2BOX)	0	0	0	1
9 (PNN2BOX)	321	6	14	1.02
10 (PNN2BOX)	84	5	16	1.06
11 (PNN2BOX)	0	0	0	1
12 (PNN2BOX)	337	6	14	1.02
13 (PNN2BOX)	2	0	0	1

Table 4: The number of events that survive in every class before the application of the DSPV, number of events with non-zero energy in the DSPV in the time interval of (-5,10)ns, total number of non-zero hits and rejection of the cut. All the other PV cuts except for the TG (including the SKIM level TGPVCUT), VC and CM have been applied at PNN2 level.

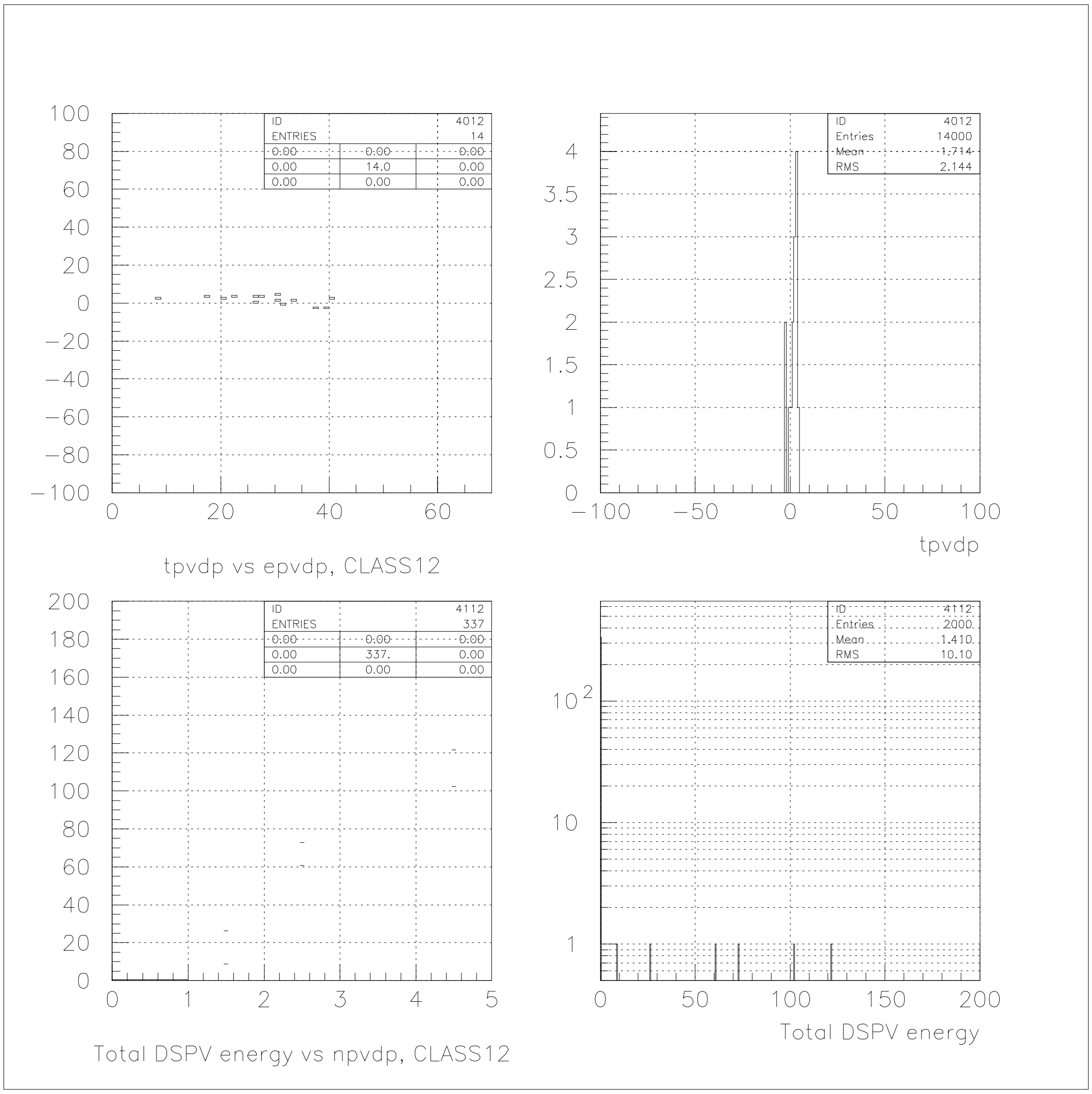

Figure 5: Time vs energy of DSPV hits (top left), time of DSPV hits (top right), total DSPV energy vs number of DSPV hits per event (bottom left) and total DSPV energy (bottom right) for class 12 (rejection sample). All the other PV cuts except for the TG (including the SKIM level TGPVCUT), VC and CM have been applied at PNN2 level.