Summary of RUN Period 25

Thomas Ruf

Start:	$29-09-1993$
End:	$15-11-1993$
People on shift:	56
Number of Spills:	≈ 370
Average beam rate:	550 kHz
$\Sigma\,\overline{p}$	$0.9 \cdot 10^{12}$
used $\overline{p}$	41%
Recorded events on tape	$560 \cdot 10^{6}$
$\pi^{+}\pi^{-}$ candidates	$38 \cdot 10^{6}$
$\pi^{o}\pi^{o}$ candidates	$1.4 \cdot 10^{6}$
Sum of written tapes:	6327
Average number	
of tapes/shift	59
in best days	78
maximum	96

Contents

1 Short Summary of RUN Period 25

Period 25 should have started at 29th of september. Because of vacuum leaks in LEAR and AA there was no beam until sunday 3th of october. Then we had just enough time to do the beam tuning when a water leak in LEAR stopped the beam for 5 hours. Problems with the AA (stack losses, low stacking efficiency) and LEAR made it very difficult to debug the detector and trigger performance in the first days. First physics tapes were written from the evening of the 8th of october on. Then again no beam from 10th of October, 1pm until 11th of October, 8pm due to vacuum problems in LEAR. Over the whole period data taking was very much reduced due to the bad LEAR performance, spills with low intensity, spills with spikes, complete losses of spills etc. The situation improved a bit after the *30th* of October. There was no electron cooling during the whole period which caused long interspill times (> 20 min). There were about $10\frac{1}{2}$ days wHre we had no beam at all. Four days were recovered by shortening LEAR machine development by one day and by extending our run by 3 days.

Compared to previous periods we changed the trigger decision on the register control level to accept all events with at least one kaon candidate and we changed the HWP2 decision to ask for at least one good pion. Until the *18th* of October we took data without using the ToF in the trigger. After introducing the ToF the number of good events on tape increased by 20%, the readout rate decreased by 10%. On the *23th* of October we started to take data without asking for a correct dE/dx of the pion candidates. The readout rate increased only by 4%.

On the 3th of November the manometer of the target hydrogen was changed. Unfortunately the old manometer was not correct calibrated and we were running with only 13.5 bar instead of 15 bar all the time before. This was found out after the run. With the new manometer we had exactly 15 bar pressure but the degrader was adjusted for 13.5 bar to give $z = 0$. The mean of the $\overline{p}$ stopping distribution was therefore shifted to -0.7 cm (see figure page 24) after the new manometer was installed.

We wrote on average 170 tapes/day over the whole period excluding the $10\frac{1}{2}$ days without beam. During the last week with only a few LEAR problems we wrote 230 tapes per day.

We had two days of special data taking with a cigar target and trigger T44401 (no kaon demanded) for precise cerenkov calibration purposes, tapes HL3572-HL3607. During half of a day we made a test with the foreseen μ-target for next year, tapes HL3536-HL3554.

2 Problems in P25

- Beam stability was very bad. Spills were lost.
- Short spill duration (< 60min) and long interspill times (no electron cooling, > 20min) caused additional deadtime. ($> 25\%$ compared to 12% last year)
- Inexperienced operator during the time that LEAR was not stable caused avoidable deadtime.
- Two magnets of our beam line (S1BVN02 and S1BHN02) were unstable. The first one was operated at its current limit and tripped from time to time. The other one started to drift near the end of the run.
- Wrong target pressure after 3th of November. Annihilation vertex was shifted by $-0.7\,$cm in z.
- PC Argon gas flow instabilities, gas meter changed.
- PC front end, broken CPI module.
- DC front end words send to trigger, particularly DC6 unstable.
- Temperature in the experimental area was higher than in summer, lack of ventilation ? There was some apprehension concerning the Cerenkov counters.
- PID LAMPF constant fraction discriminator unstable, changed for PSI modules.
- Frequent ST trips. Seem to be very sensitive to bad beam structure.
- One CAEN HV-controller stopped working. Few tapes (HL3572 - HL3607) without useful CALO information.
- Water leak under rack Z5/Z6. Temporary fixed.
- Frequent (1/day) crashes of EB-DDS-TAPE valets.
- Exabyte drives used for copying started to die near the end of the run.

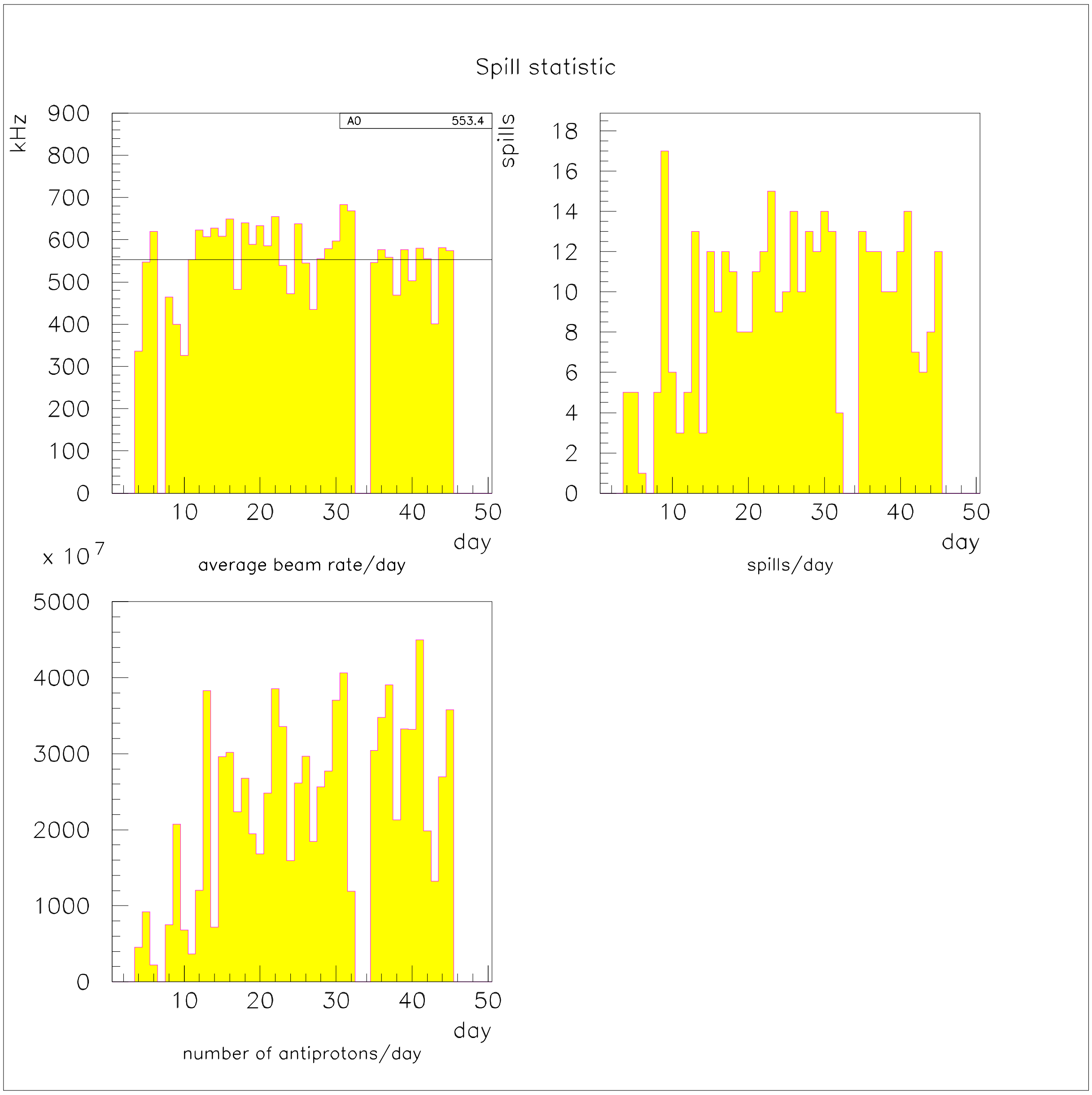
- Some incorrectly labelled tapes found. Solved by checking the labels on the DEC5000 before putting them to the tapedrive. Tape system also automatically overwrites with correct label.
- Crashes of VSCP08 due to faulty memory card delivered by DEC.

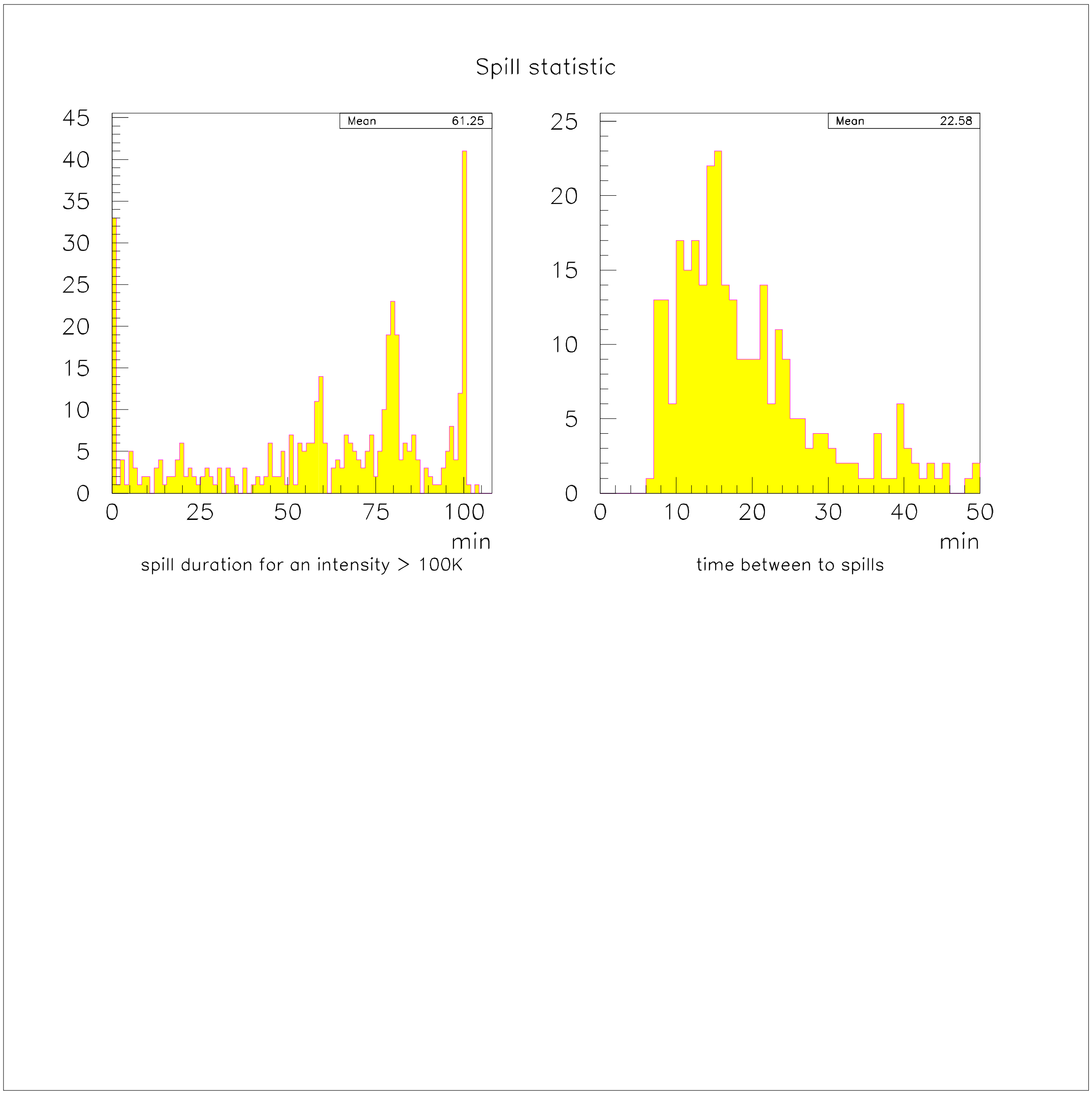
3 Tape summary

Trigger	no field	positive field	negative field
1	0	133	90
323	0	0	4
401	0	0	9
44401	0	72	37
63323	0	2	0
163323	0	2	0
5063323	0	1	0
7183323	0	0	19
605063323	0	1	0
605163323	0	661	696
607163323	0	2354	2247
	all tapes: 6327		

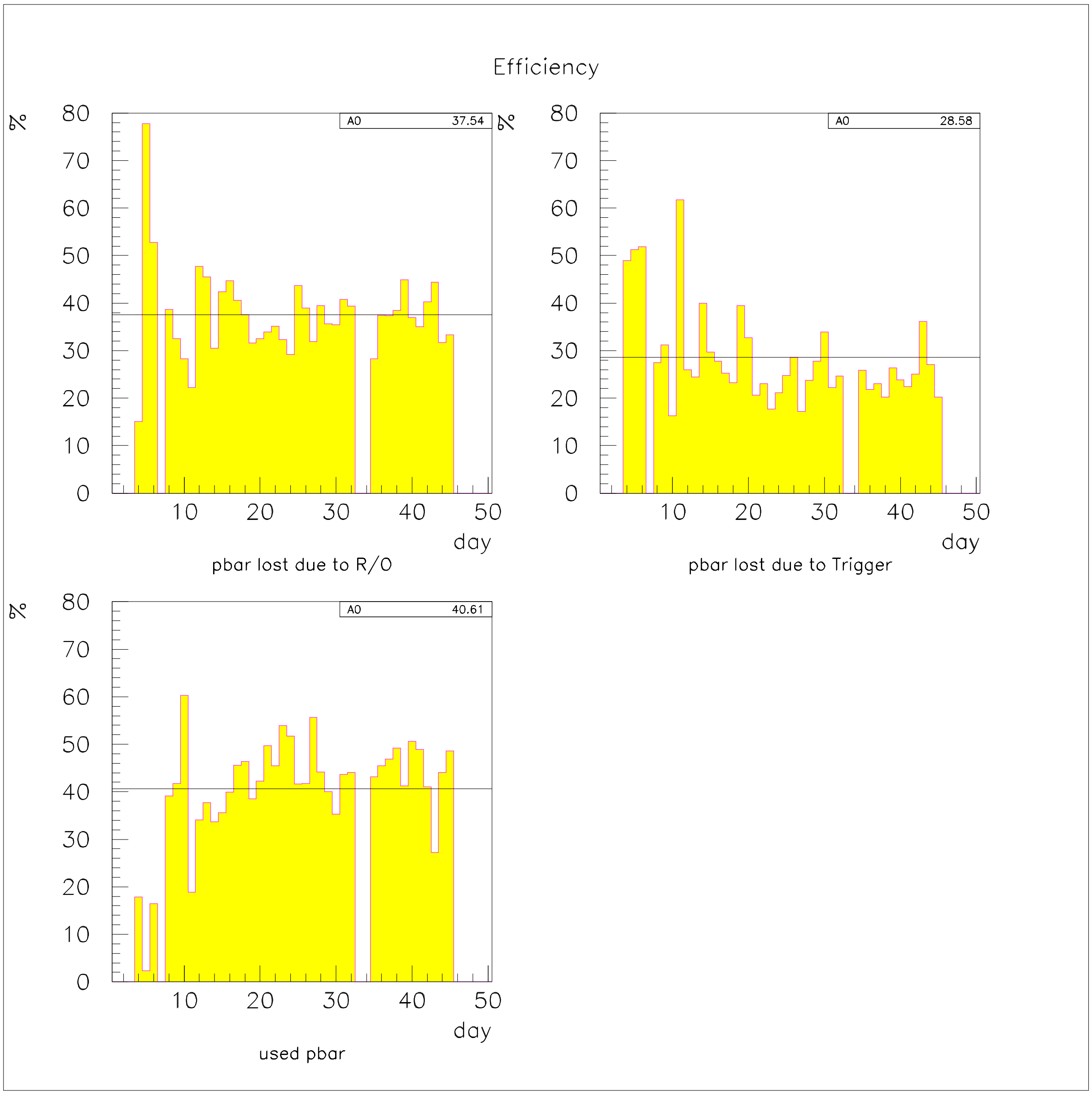
4 Some histograms

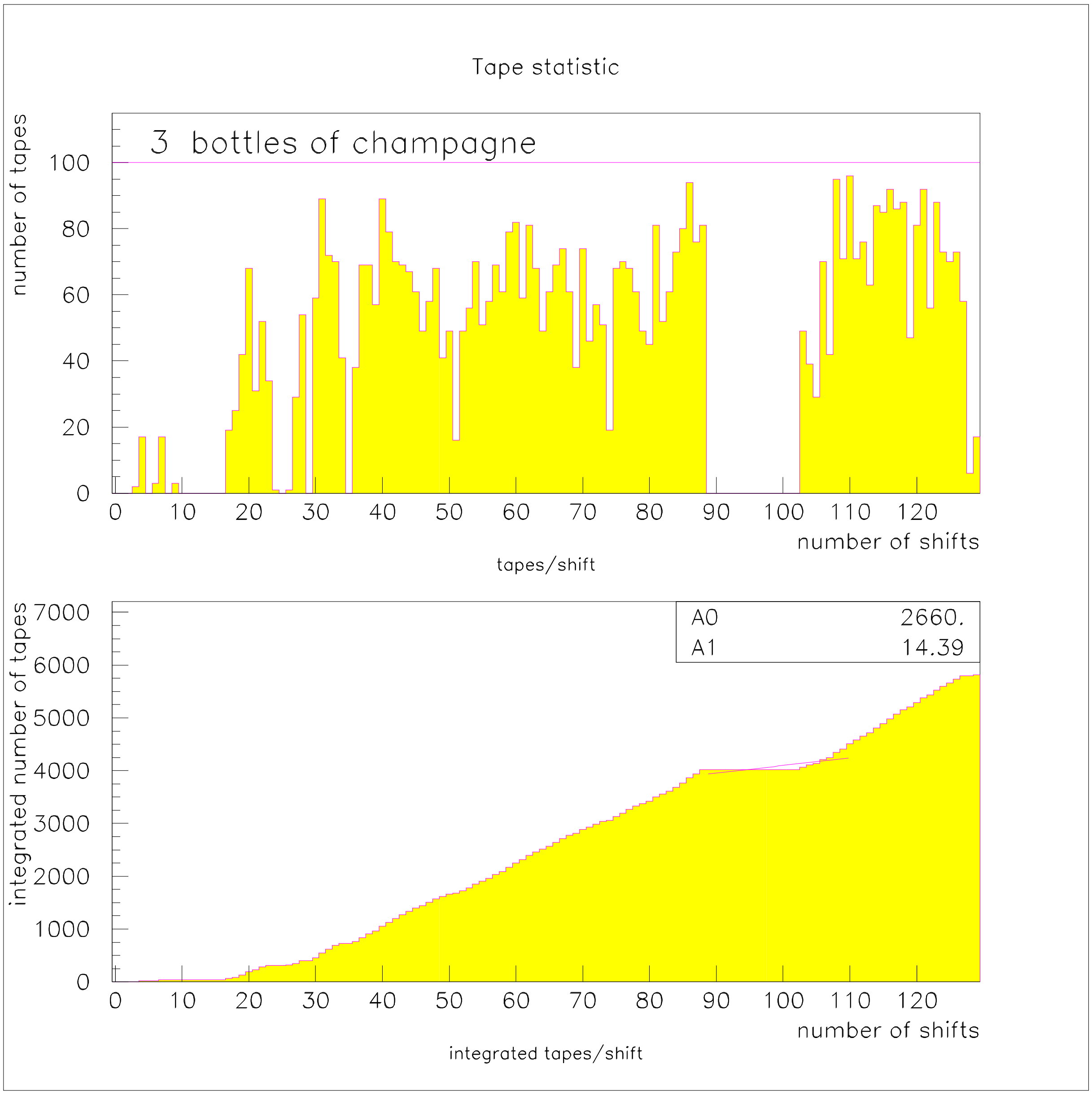
Page 6	Fig.1:	Average beam rate during a day
	Fig.2:	Total number of $\overline{p}$ received during a day
	Fig.3:	Number of spills during a day
Page 7	Fig.1:	Spill duration for intensities $>$ 100 kHz average 53min, last year 85min.
	Fig.2:	Time between two spills
Page 8	Fig.1:	Percentage of antiprotons lost due to readout deadtime
	Fig.2:	Percentage of antiprotons lost due to trigger deadtime
	Fig.3:	Percentage of used antiprotons
Page 9	Fig.1:	Number of tapes per shift
	Fig.2:	Integrated number of tapes as a function of shifts The fit was applied to a period when the LEAR performance was best.
Page 10	Fig.1:	Readout time as a function of the $\overline{p}$ rate
Page 11	Fig.1:	Percentage of $K^o \to \pi^+\pi^-$ candidates over the period
	Fig.2:	Percentage of $K^o \to \pi^o\pi^o$ candidates over the period

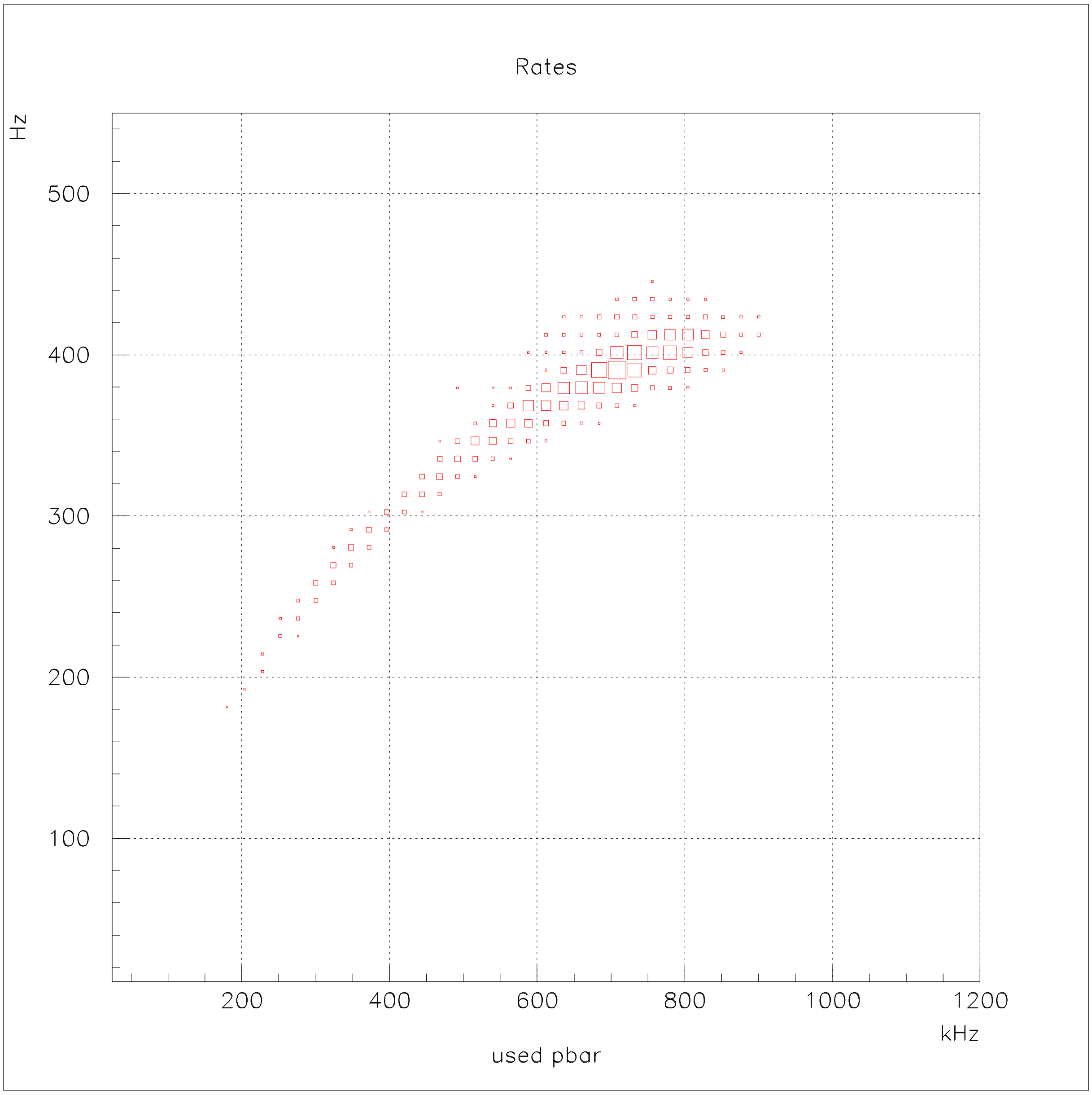

Spill statistic
kHz
A0 553.4
average beam rate/day
day
spills
spills/day
day
x 10^7
number of antiprotons/day
day

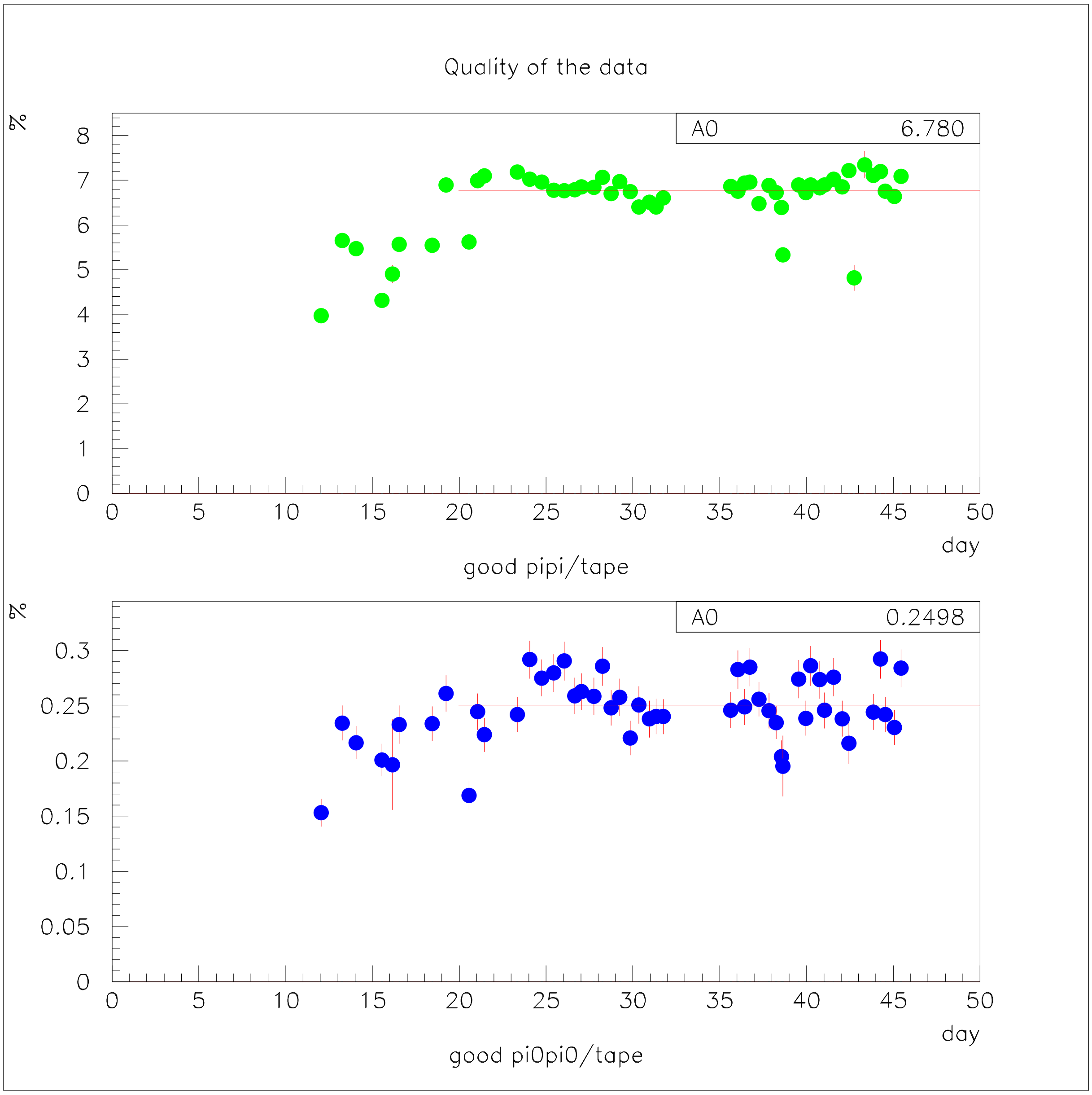


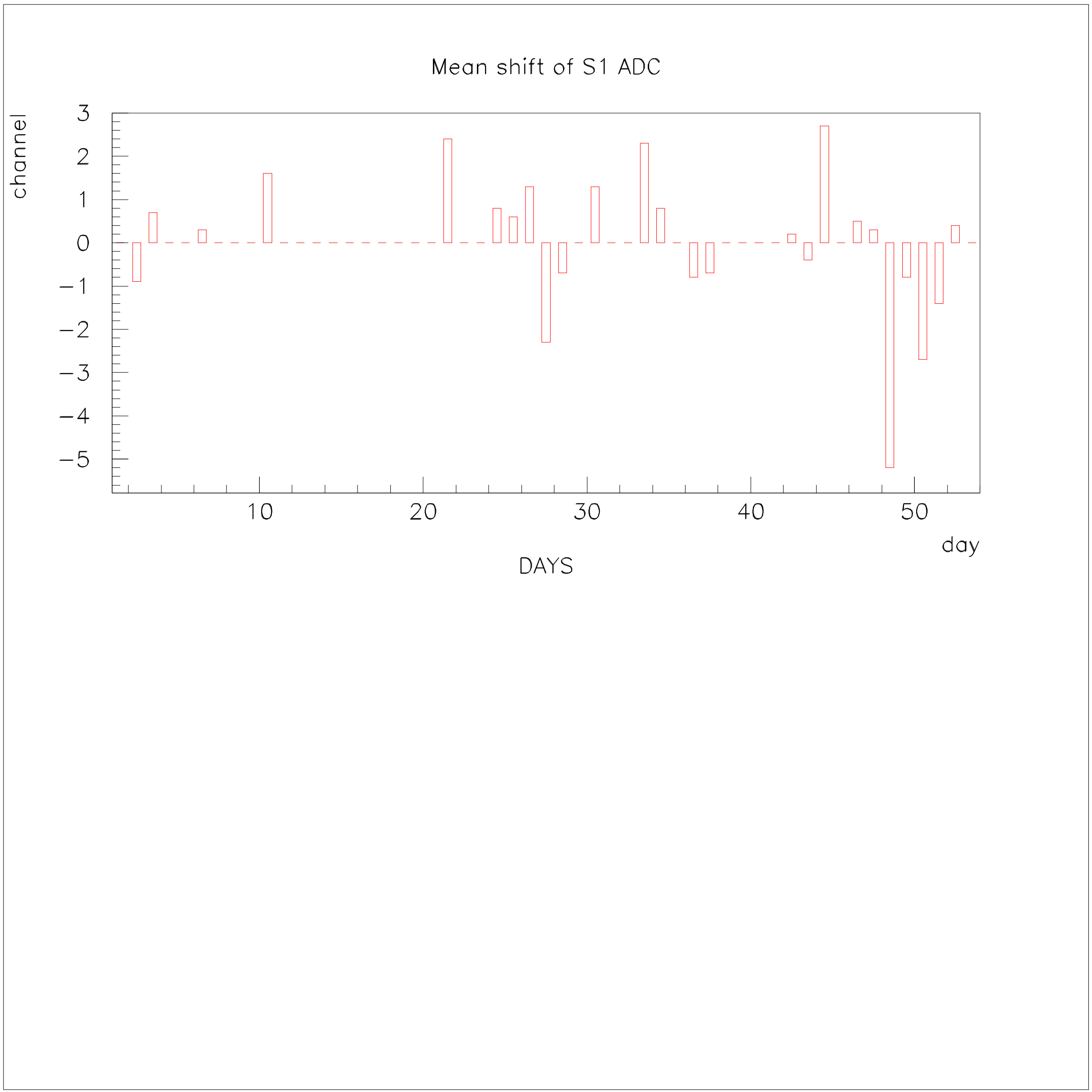
Spill statistic
Mean 61.25
45
40
35
30
25
20
15
10
5
0
0
25
50
75
100
min
spill duration for an intensity > 100K
Mean 22.58
25
20
15
10
5
0
0
10
20
30
40
50
min
time between to spills

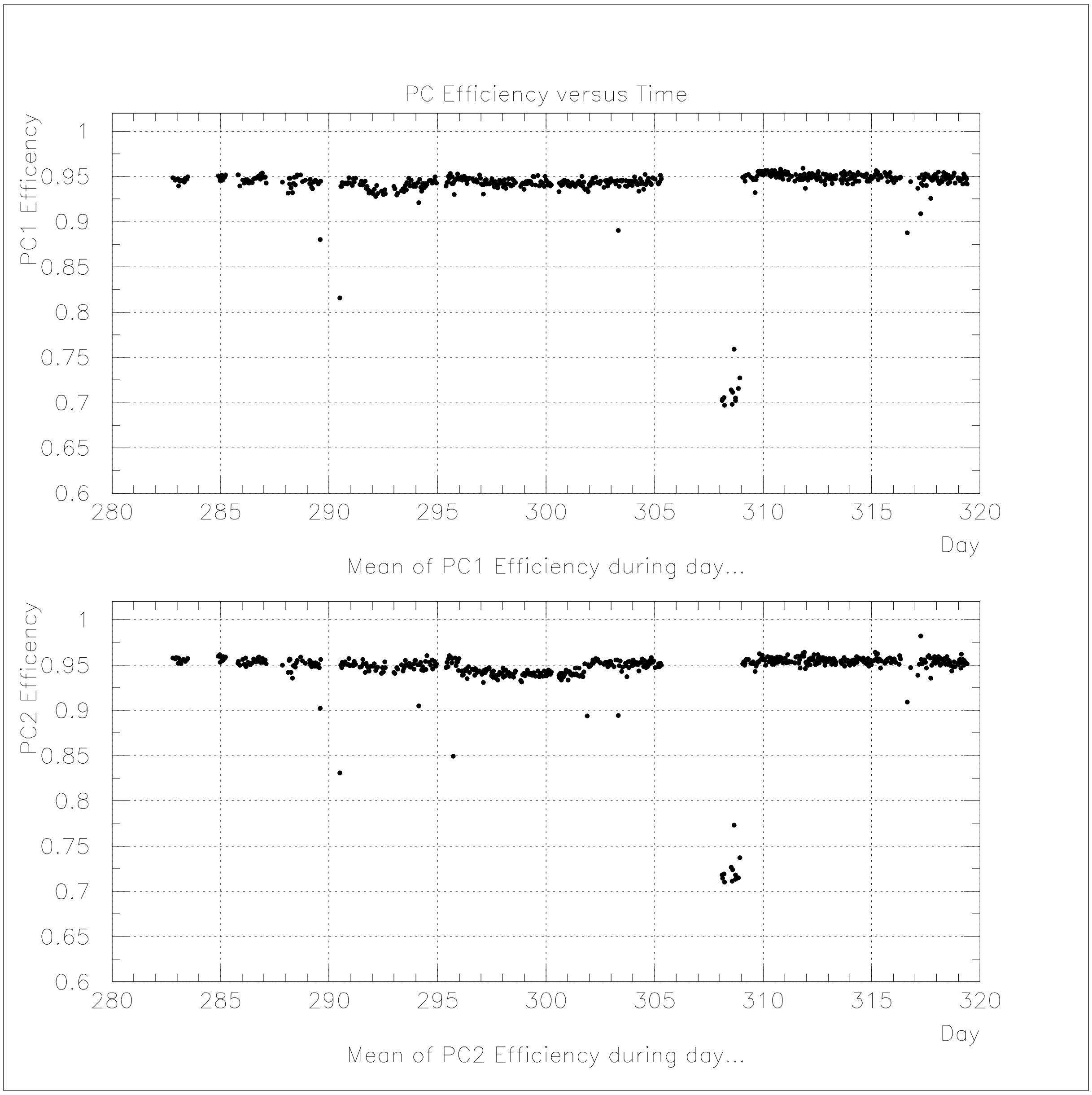

Efficiency
%
80
70
60
50
40
30
20
10
0
A0 37.54
10
20
30
40
50
day
pbar lost due to R/O
A0 28.58
pbar lost due to Trigger
A0 40.61
used pbar

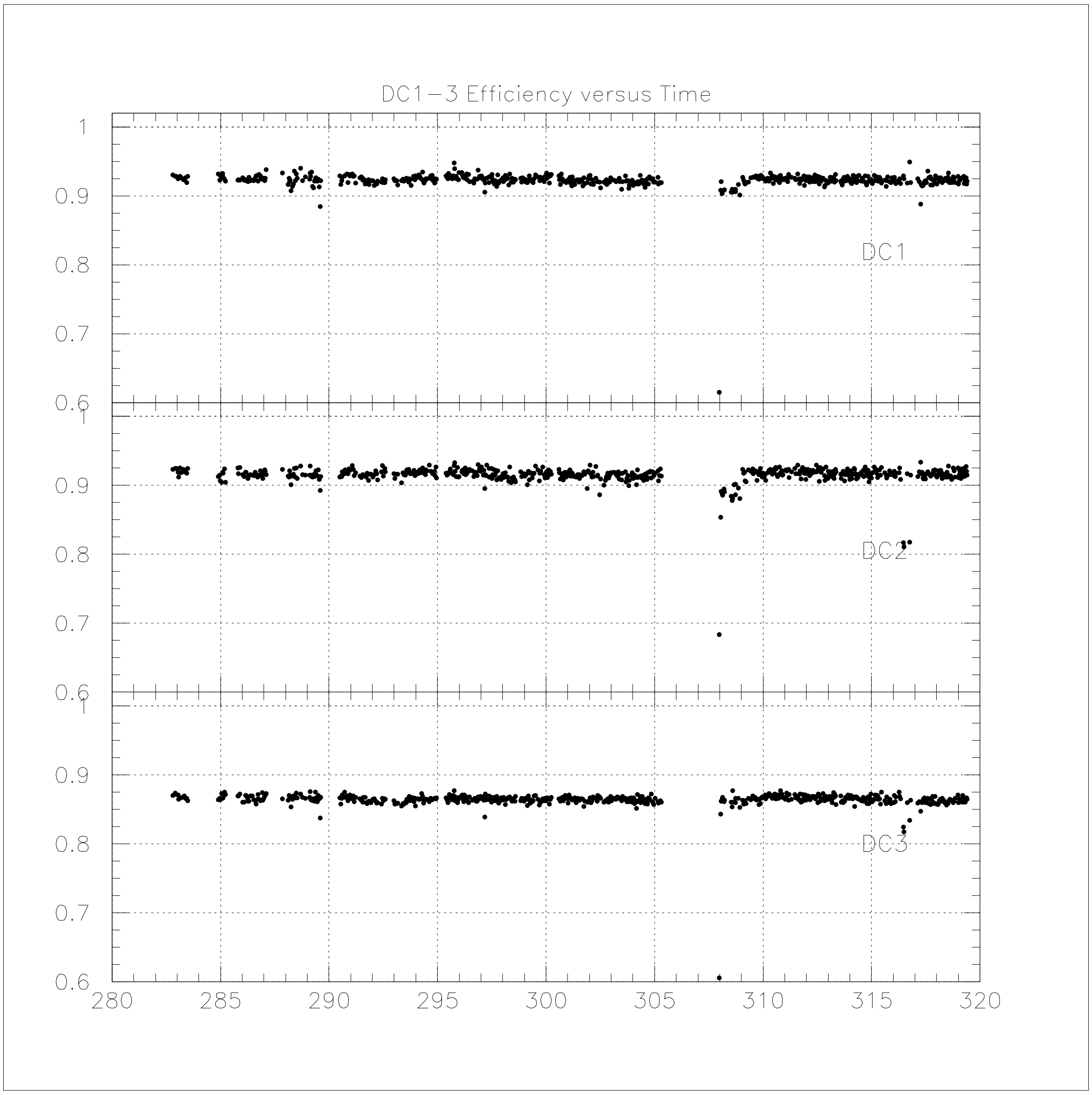

Tape statistic
number of tapes
3 bottles of champagne
100
80
60
40
20
0
0 10 20 30 40 50 60 70 80 90 100 110 120
number of shifts
tapes/shift
integrated number of tapes
7000
6000
5000
4000
3000
2000
1000
0
A0 2660.
A1 14.39
0 10 20 30 40 50 60 70 80 90 100 110 120
number of shifts
integrated tapes/shift

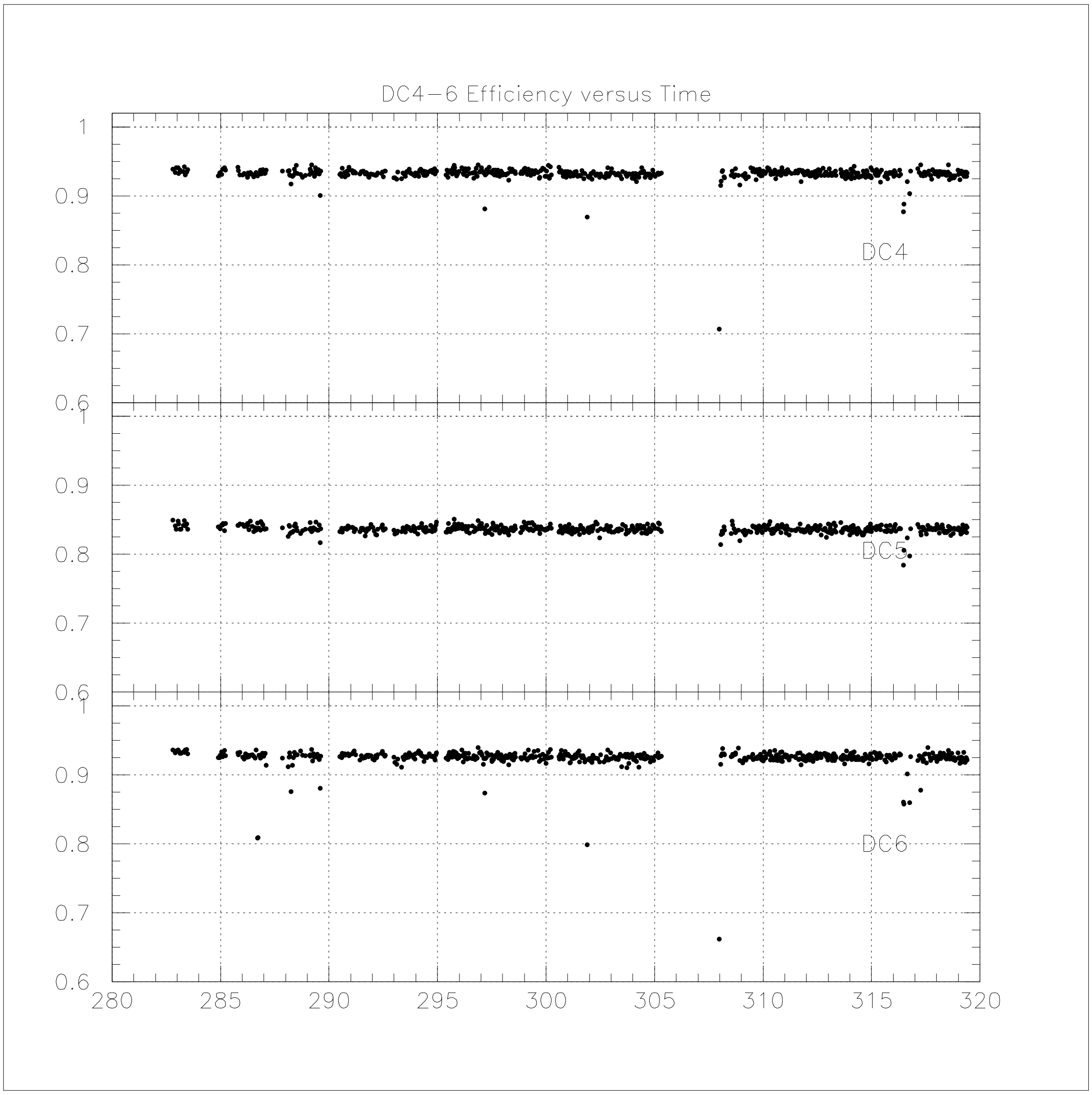

Rates
Hz
500
400
300
200
100
200
400
600
800
1000
1200
kHz
used pbar

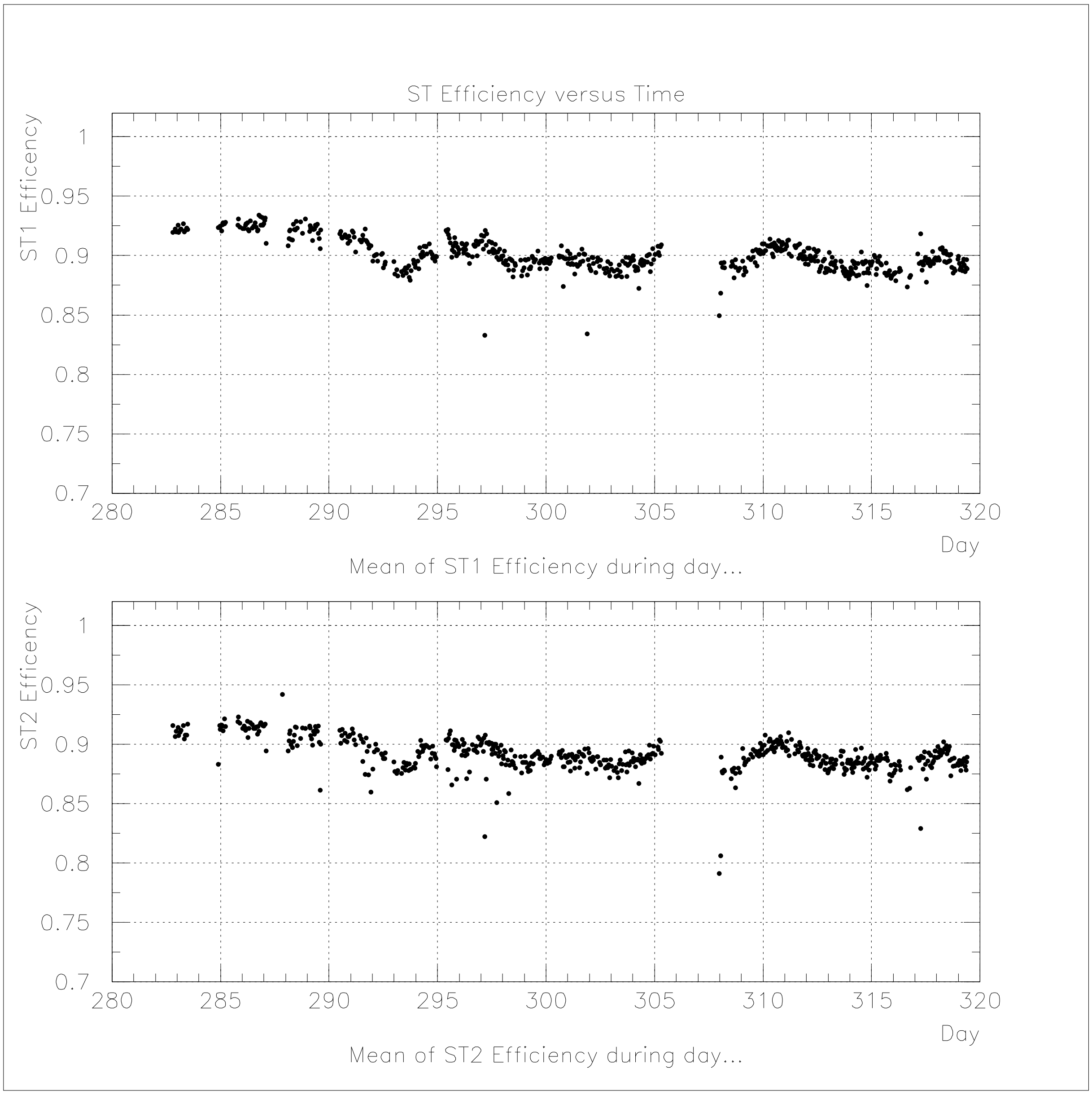

Quality of the data
%
A0 6.780
good pipi/tape
day
%
A0 0.2498
good pi0pi0/tape
day

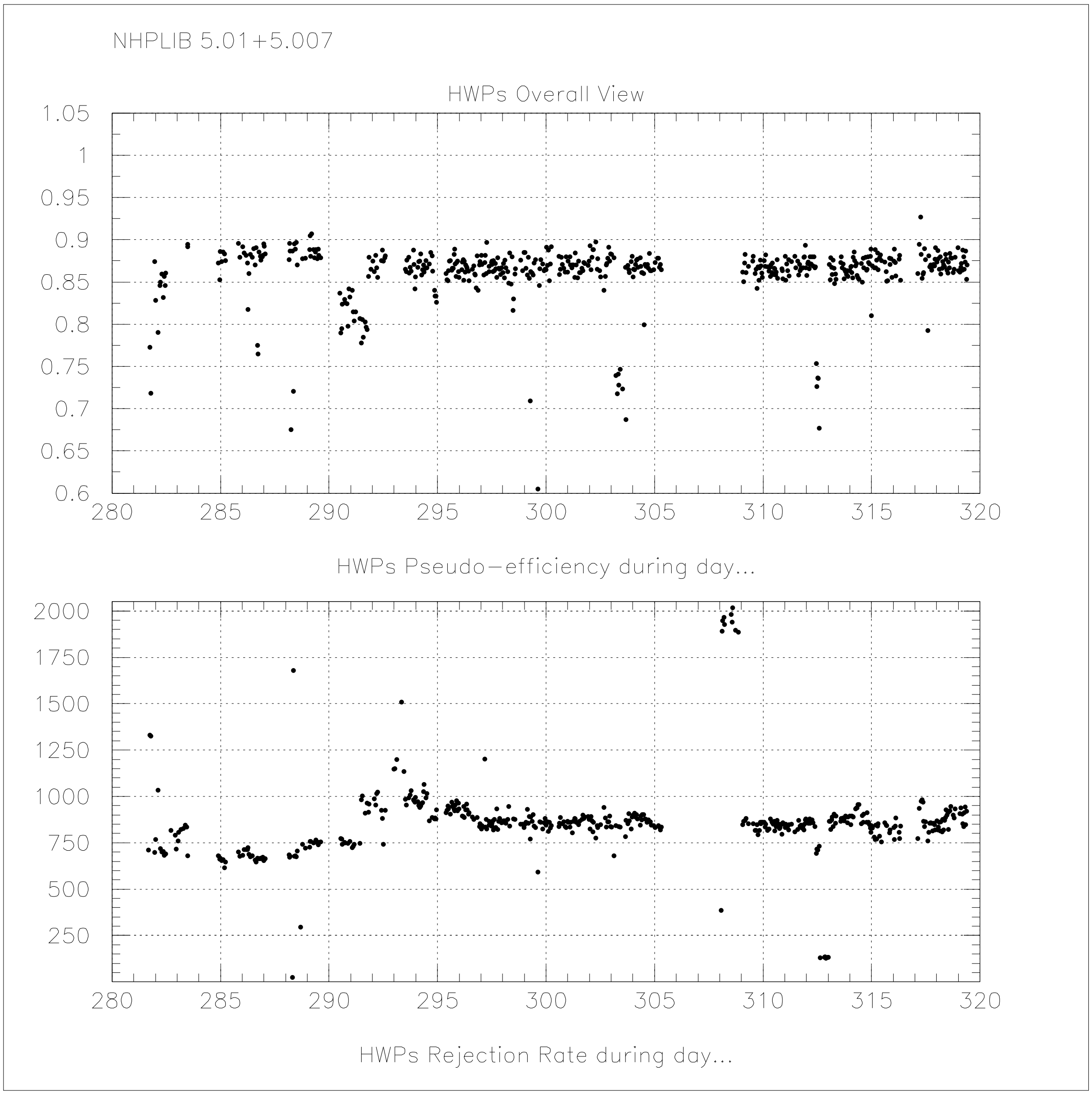

Mean shift of S1 ADC
channel
3
2
1
0
−1
−2
−3
−4
−5
10
20
30
40
50
day
DAYS


PC Efficiency versus Time
PC1 Efficency
Day
Mean of PC1 Efficiency during day...
PC2 Efficency
Day
Mean of PC2 Efficiency during day...

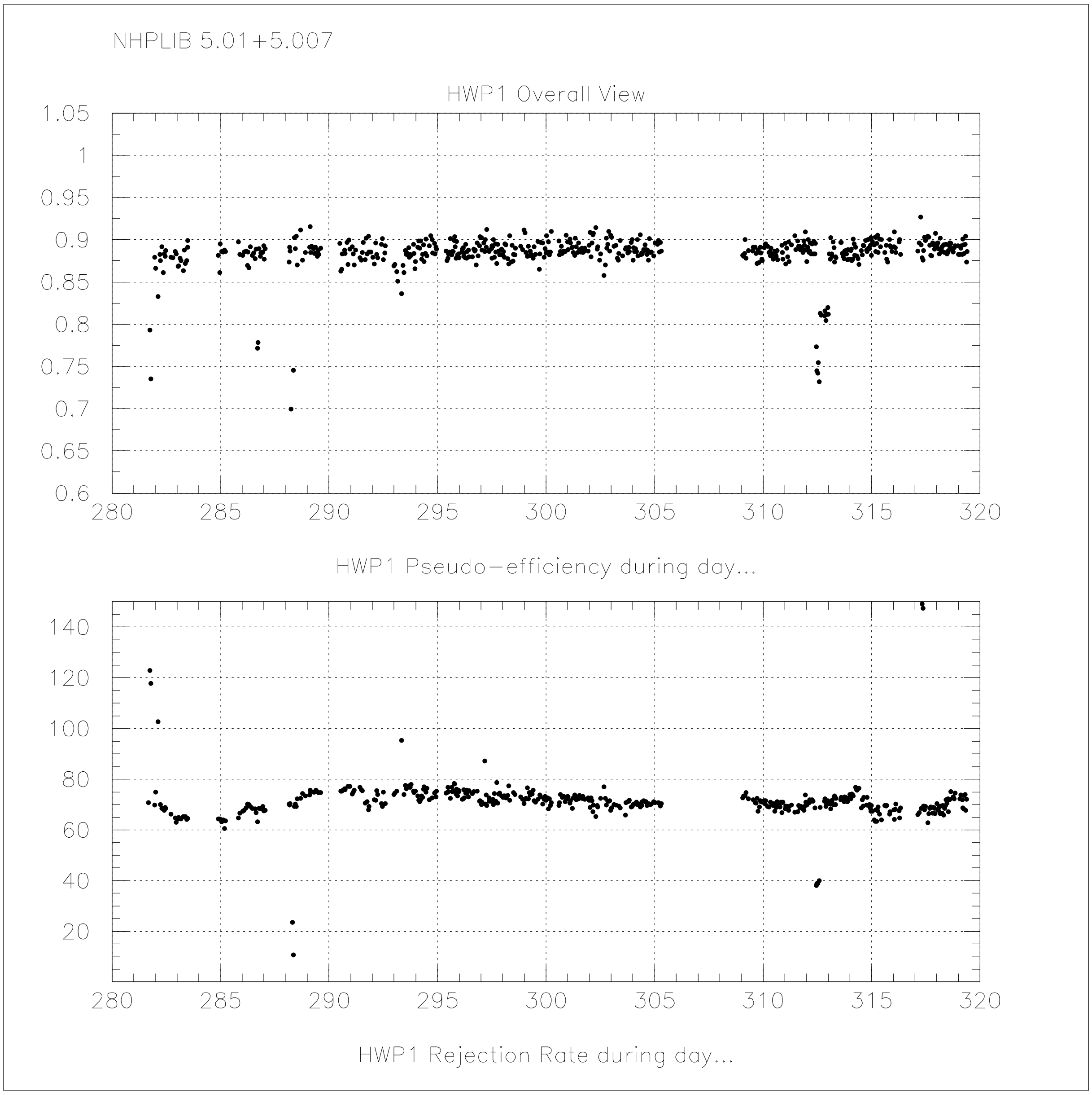

DC1−3 Efficiency versus Time
DC1
DC2
DC3
1
0.9
0.8
0.7
0.6
280
285
290
295
300
305
310
315
320

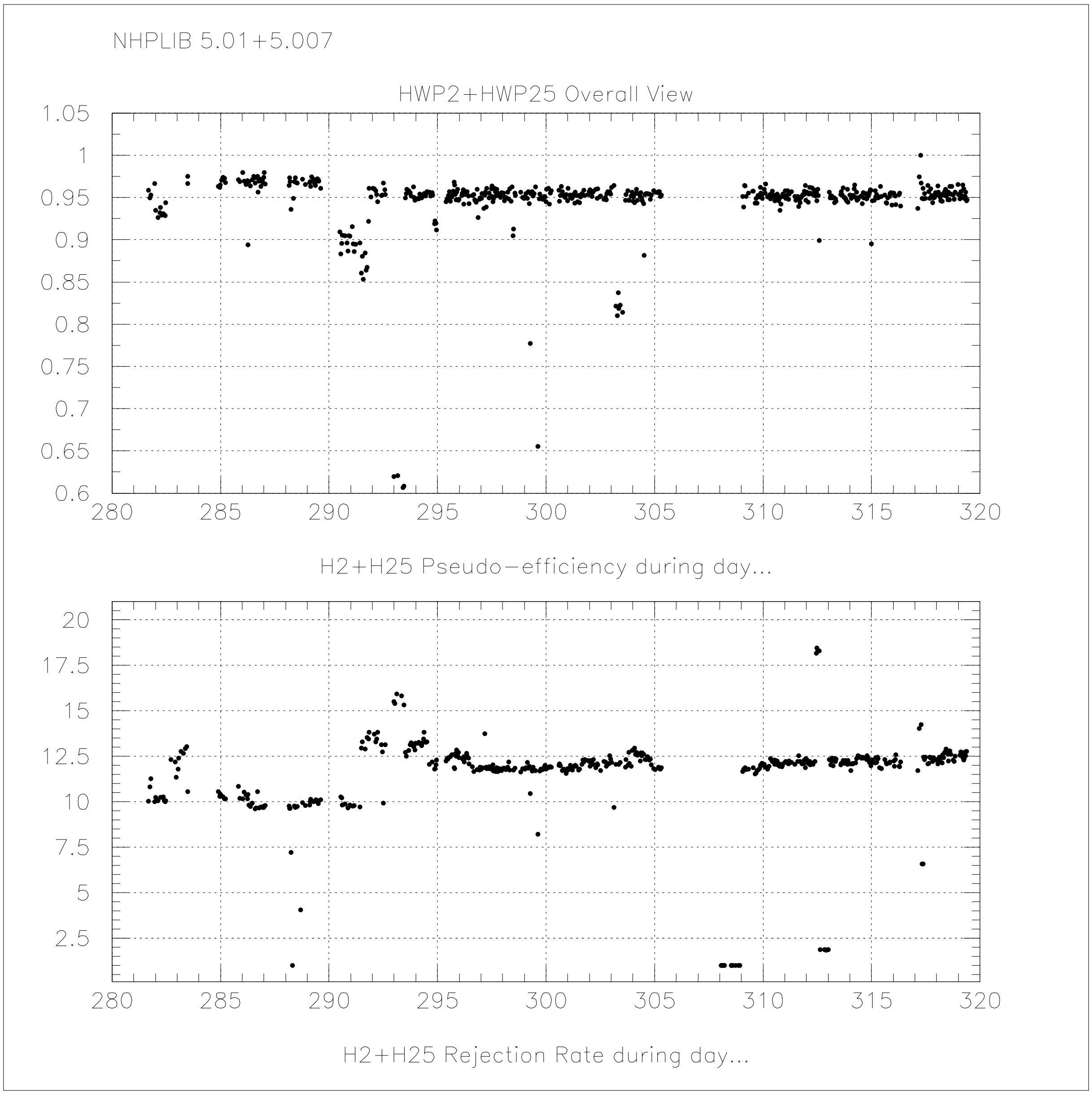

DC4−6 Efficiency versus Time
DC4
DC5
DC6
1
0.9
0.8
0.7
0.6
280
285
290
295
300
305
310
315
320

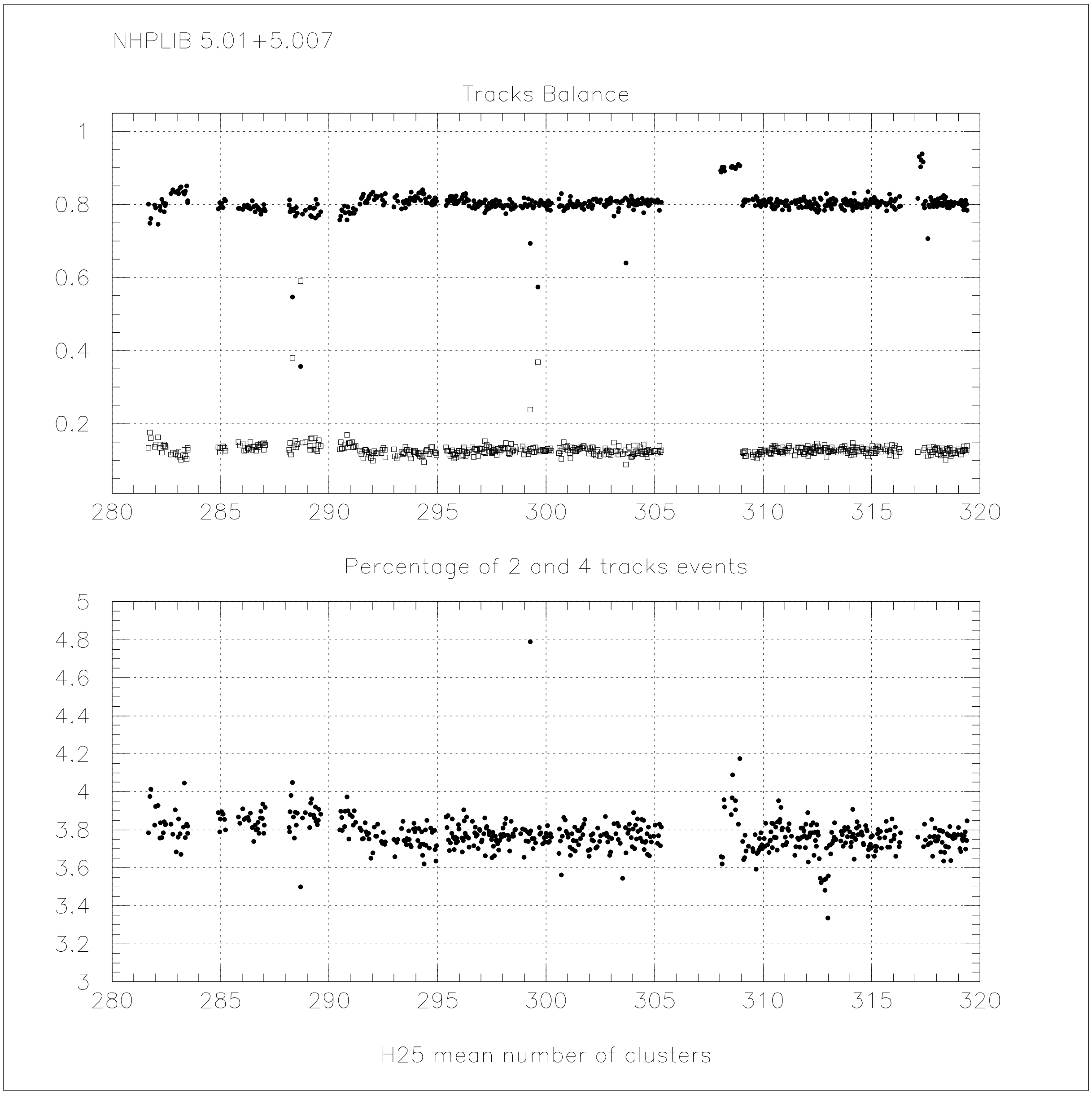

ST Efficiency versus Time
ST1 Efficency
1
0.95
0.9
0.85
0.8
0.75
0.7
280
285
290
295
300
305
310
315
320
Day
Mean of ST1 Efficiency during day...
ST2 Efficency
1
0.95
0.9
0.85
0.8
0.75
0.7
280
285
290
295
300
305
310
315
320
Day
Mean of ST2 Efficiency during day...

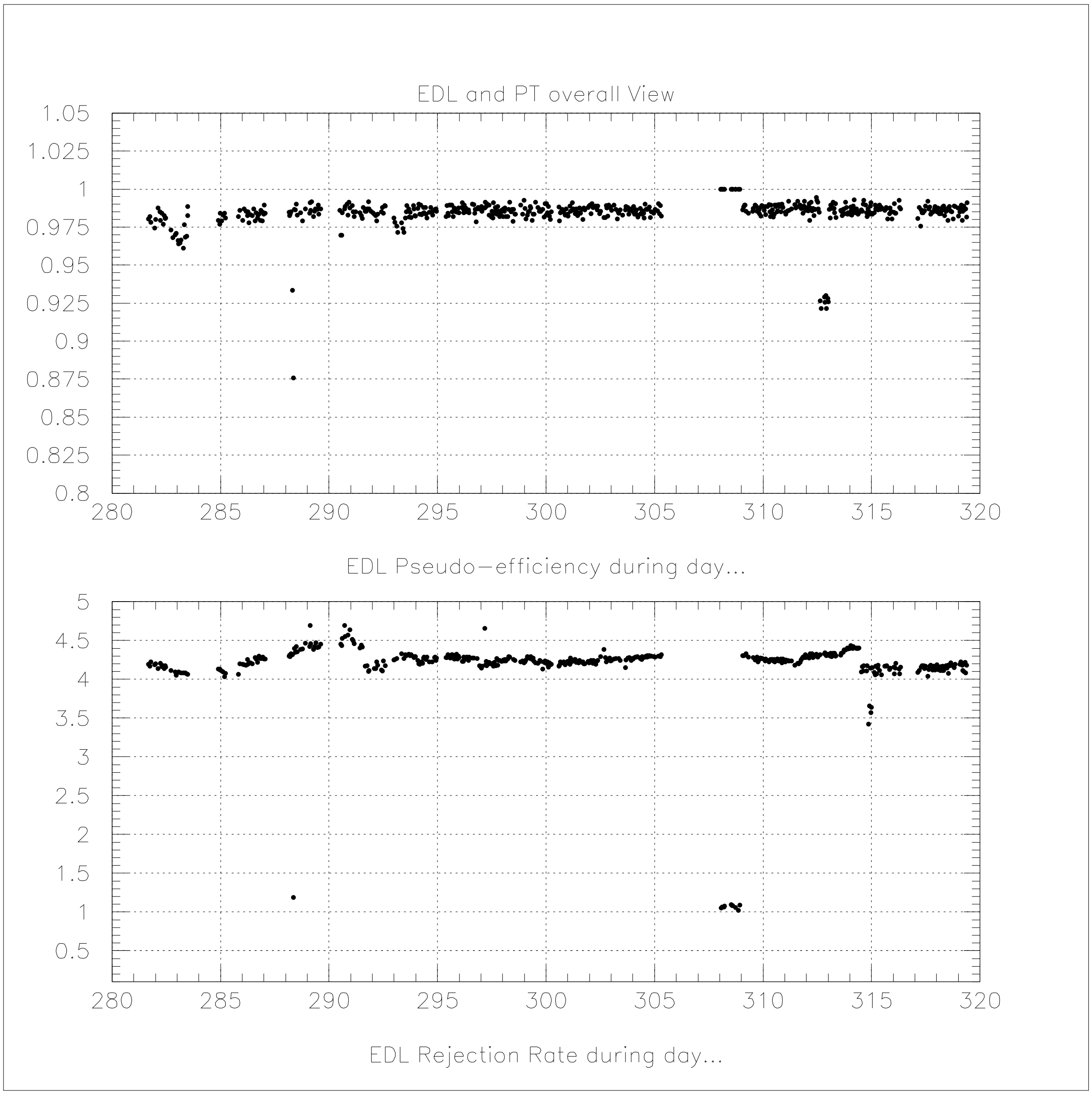


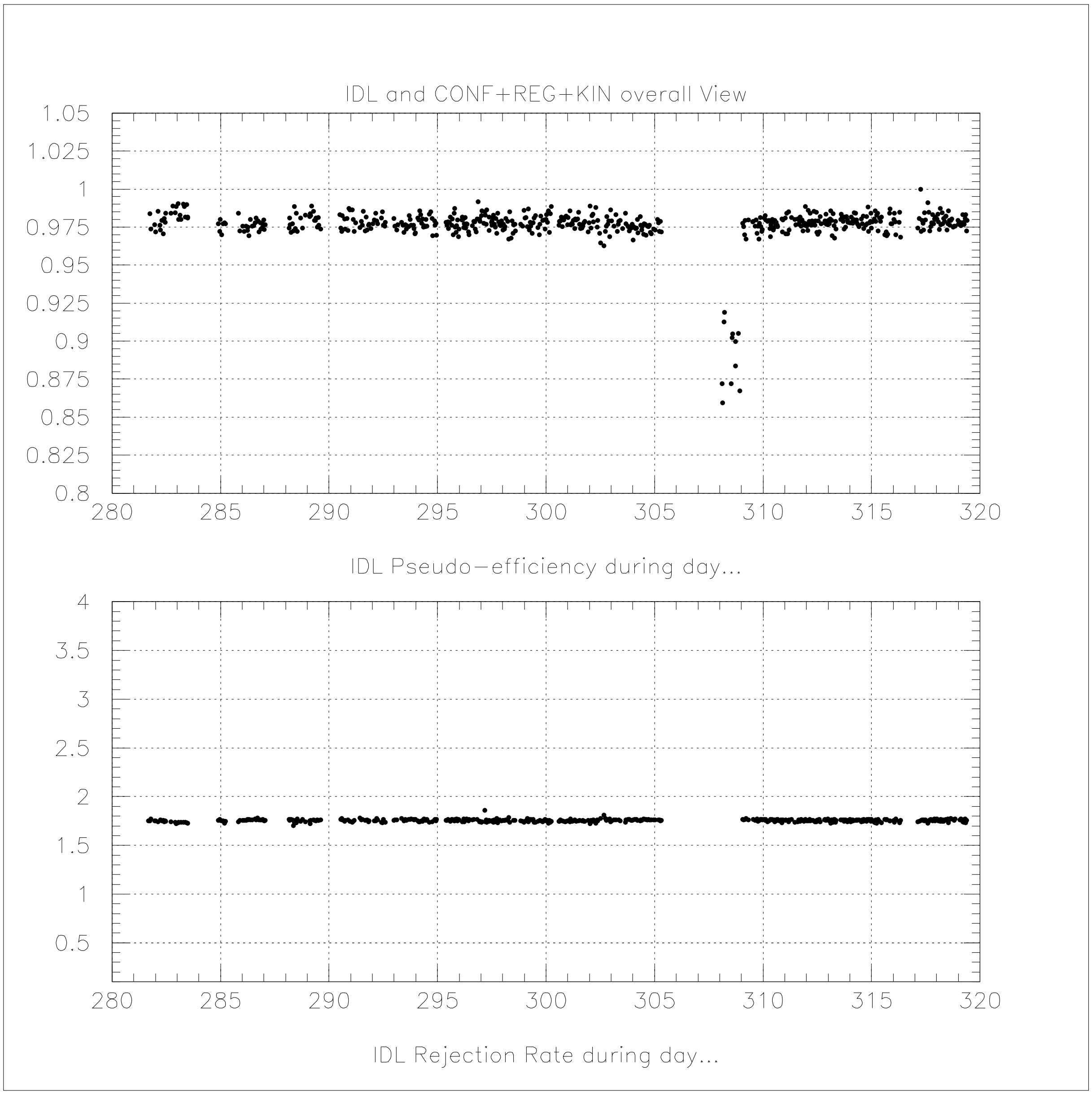
NHPLIB 5.01+5.007
HWPs Overall View
HWPs Pseudo−efficiency during day...
HWPs Rejection Rate during day...

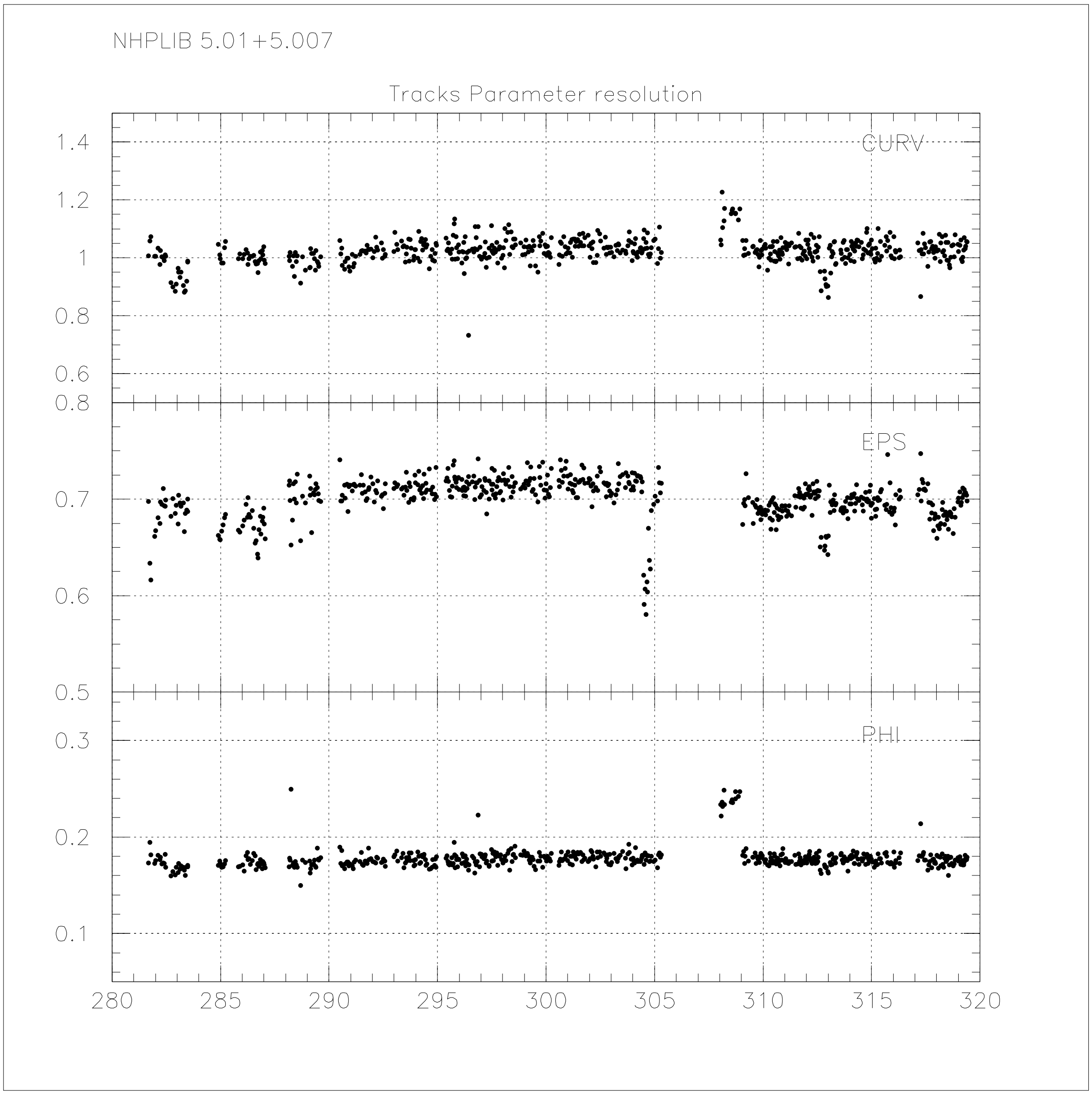

NHPLIB 5.01+5.007
HWP1 Overall View
1.05
1
0.95
0.9
0.85
0.8
0.75
0.7
0.65
0.6
280
285
290
295
300
305
310
315
320
HWP1 Pseudo−efficiency during day...
140
120
100
80
60
40
20
280
285
290
295
300
305
310
315
320
HWP1 Rejection Rate during day...

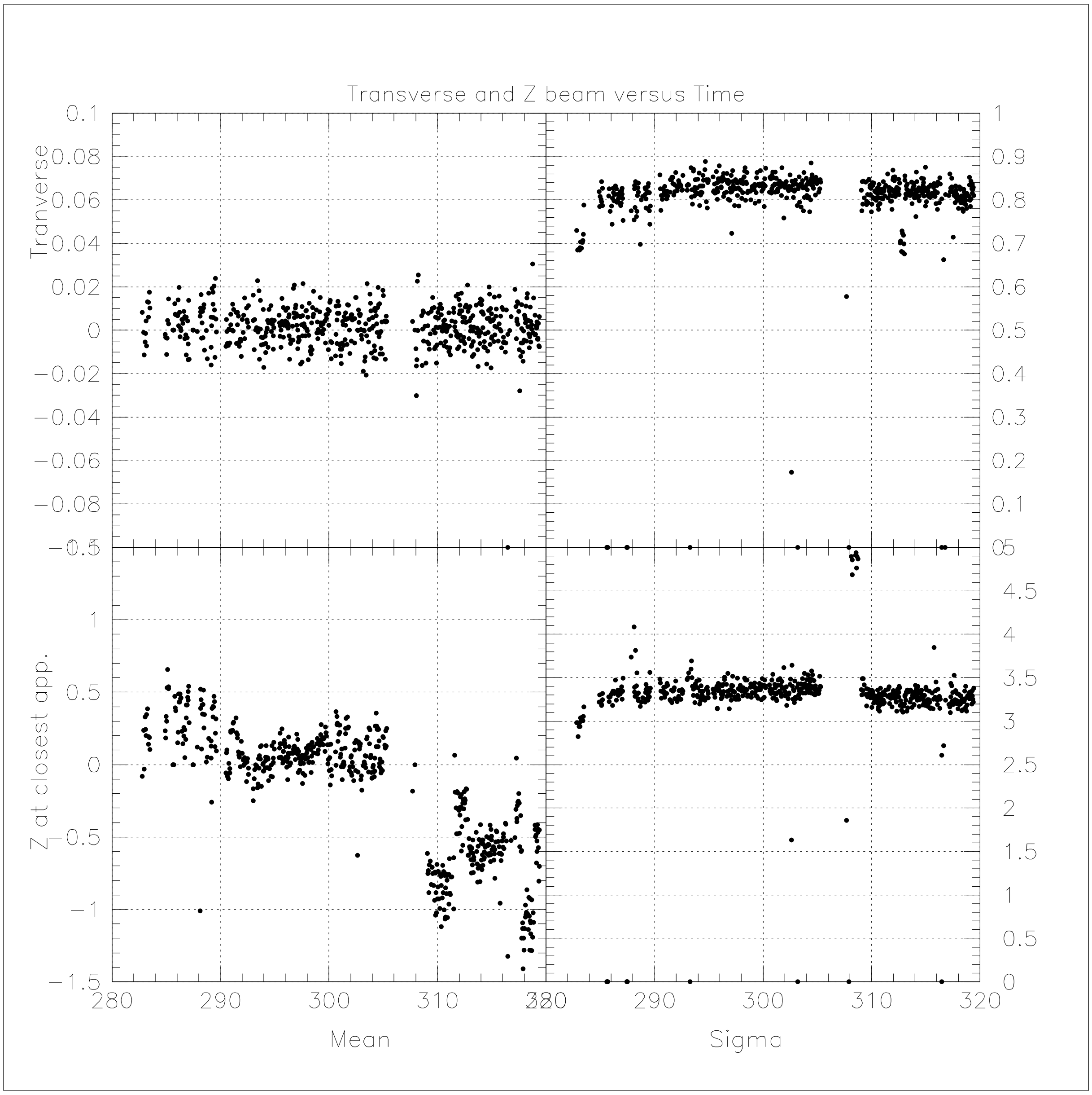

NHPLIB 5.01+5.007
HWP2+HWP25 Overall View
1.05
1
0.95
0.9
0.85
0.8
0.75
0.7
0.65
0.6
280
285
290
295
300
305
310
315
320
H2+H25 Pseudo−efficiency during day...
20
17.5
15
12.5
10
7.5
5
2.5
280
285
290
295
300
305
310
315
320
H2+H25 Rejection Rate during day...


NHPLIB 5.01+5.007
Tracks Balance
1
0.8
0.6
0.4
0.2
280
285
290
295
300
305
310
315
320
Percentage of 2 and 4 tracks events
5
4.8
4.6
4.4
4.2
4
3.8
3.6
3.4
3.2
3
280
285
290
295
300
305
310
315
320
H25 mean number of clusters


EDL and PT overall View
1.05
1.025
1
0.975
0.95
0.925
0.9
0.875
0.85
0.825
0.8
280
285
290
295
300
305
310
315
320
EDL Pseudo−efficiency during day...
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
280
285
290
295
300
305
310
315
320
EDL Rejection Rate during day...


IDL and CONF+REG+KIN overall View
1.05
1.025
1
0.975
0.95
0.925
0.9
0.875
0.85
0.825
0.8
280
285
290
295
300
305
310
315
320
IDL Pseudo−efficiency during day...
4
3.5
3
2.5
2
1.5
1
0.5
280
285
290
295
300
305
310
315
320
IDL Rejection Rate during day...


NHPLIB 5.01+5.007
Tracks Parameter resolution
CURV
EPS
PHI
1.4
1.2
1
0.8
0.6
0.7
0.5
0.3
0.2
0.1
280
285
290
295
300
305
310
315
320



Transverse and Z beam versus Time
Tranverse
Z at closest app.
Mean
Sigma