Polarization in H1 :
How to access information?

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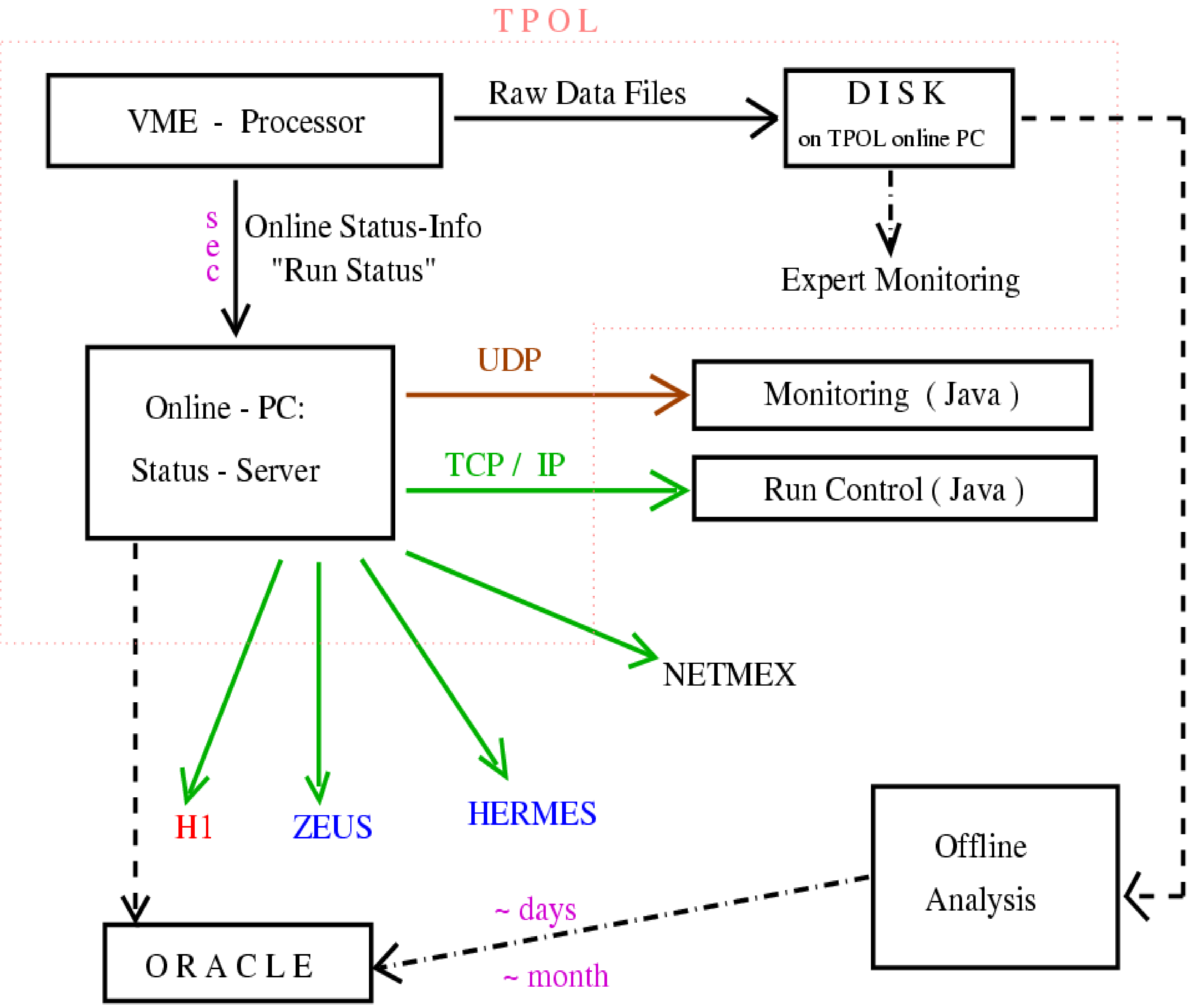
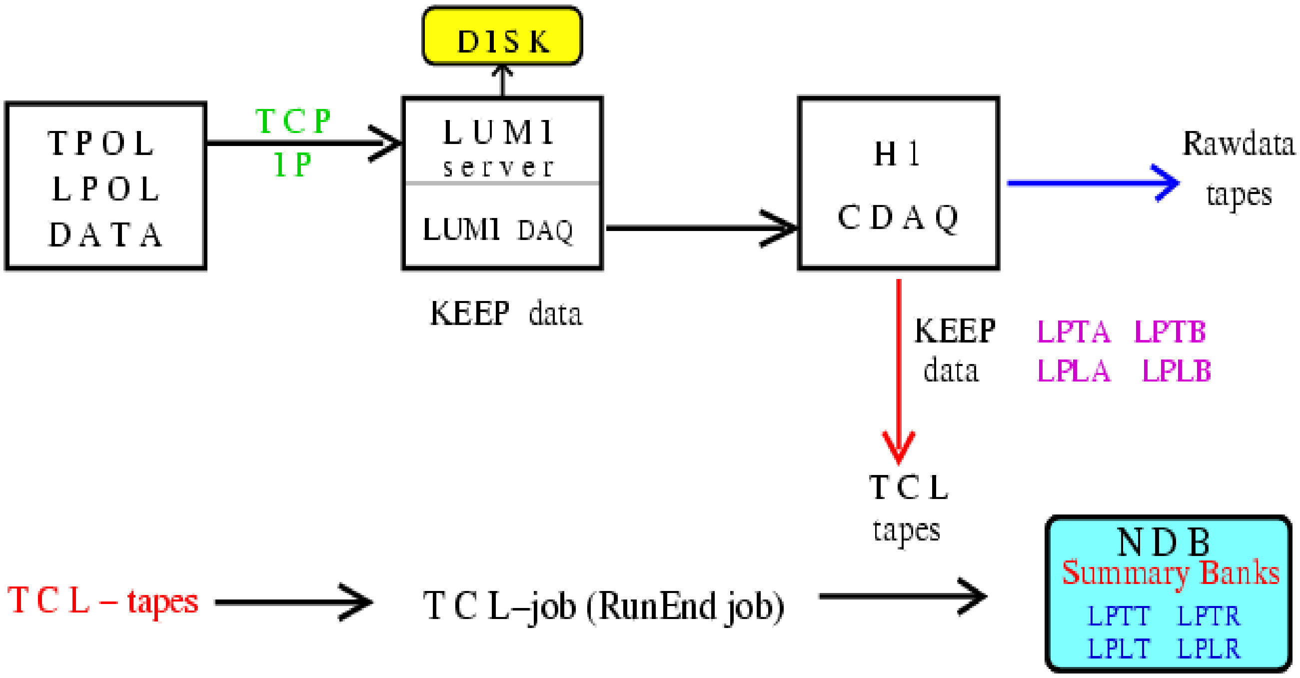
Polarization Data Flow (general overview)



Polarization Data in H1



KEEP banks (in H1 data flow since 2002)

LPTA : Trans. Pol. averaged data and related info

LPTB : Trans. Pol. single bunch data

LPLA : Long. Pol. averaged data and related info

LPLB : Long. Pol. single bunch data

LPTB keep bank

```
---------------------------------------------------------------------------
 !       BANKname  BANKtype        !Comments
 !
  TABLE   LPTB      B16             ! Polarization_Transverse_singleBunch_data
                                    ! (non-event bank (KEEP-bank))
 !   ATTributes:
 !   -----------
 !
 !COL ATT-name FMT Min    Max    !Comments
 !
 !--- Single Bunch Transverse Polarization and Errors, averaged over 1 min.
 !      Time-stamp for the polarization measurement is calculated by
 !      averaging the start and stop time of the relevant laser-on cycle.
 !
 !---------------------   Time-stamp  ---------------------------------
 !
 1   UNIXTIME       I -INF +INF    ! Unix time, bits 16 - 31
 2   UNIXTIME       I -INF +INF    ! Unix time, bits  0 - 15
 !
 !-------------------------------------------------------------------
                                    !
 3   pol[0]    I -INF +INF          ! transverse beam polarization
                                    ! of first bunch, *100 (50.33% = 5033)
                                    ! (averaged over 1 min.)
 4   pol[1]    I -INF +INF          ! transverse beam polarization
                                    ! of second bunch, *100
                                    ! (averaged over 1 min.)
 !           ...
 222 pol[219] I -INF +INF           ! transverse beam polarization
                                    ! of bunch number 220, *100
                                    ! (averaged over 1 min.)
                                    !
 !--------------------------------------------------------------------
                                    !
 223 polerr[0]   I -INF +INF        ! error on transverse beam polarization
                                    ! of first bunch, *100
                                    ! (averaged over 1 min.)
 224 polerr[1]   I -INF +INF        ! error on transverse beam polarization
                                    ! of second bunch, *100
                                    ! (averaged over 1 min.)
 !           ...
 442 polerr[219] I -INF +INF        ! error on transverse beam polarization
                                    ! of bunch number 220, *100
                                    ! (averaged over 1 min.)

 END TABLE
```

LPLB keep bank

```
-----------------------------------------------------------------------------
 !       BANKname BANKtype       !Comments
 !
  TABLE   LPLB     B16           ! Polarization_Longitudinal_singleBunch_data
                                 ! (non-event bank (KEEP-bank))
 !   ATTributes:
 !   -----------
 !
 !COL ATT-name FMT Min    Max    !Comments
 !
 !--- Single Bunch Longitudinal Polarization and Errors, averaged over 5 min.
 !         Time-stamp corresponds to the mean time of all contributing
 !                        laser-on measurement intervals
 !
 !---------------------   Time-stamp  ---------------------------------
 !
 1   UNIXTIME       I -INF +INF   ! Unix time, bits 16 - 31
 2   UNIXTIME       I -INF +INF   ! Unix time, bits  0 - 15
 !
 !--------------------------------------------------------------------
 !
 3   pol[0]    I -INF +INF        ! longitudinal beam polarization
                                  ! of first bunch, *100 (50.33% = 5033)
                                  ! (averaged over 5 min.)
 4   pol[1]    I -INF +INF        ! longitudinal beam polarization
                                  ! of second bunch, *100
                                  ! (averaged over 5 min.)
 !           ...
 222 pol[219] I -INF +INF         ! longitudinal beam polarization
                                  ! of bunch number 220, *100
                                  ! (averaged over 5 min.)
                                  !
 !-----------------------------------------------------------------------
                                  !
 223 polerr[0]  I -INF +INF       ! error on longitudinal beam polarization
                                  ! of first bunch, *100
                                  ! (averaged over 5 min.)
 224 polerr[1]  I -INF +INF       ! error on longitudinal beam polarization
                                  ! of second bunch, *100
                                  ! (averaged over 5 min.)
 !           ...
 442 polerr[219] I -INF +INF      ! error on longitudinal beam polarization
                                  ! of bunch number 220, *100
                                  ! (averaged over 5 min.)

 END TABLE
```

LPTA keep bank

```
-----------------------------------------------------------------------------
 !       BANKname  BANKtype       !Comments
 !
  TABLE   LPTA      B16            ! Polarization_Transverse_Averaged_data
                                   !   measurements and related info
                                   !   (non-event bank (KEEP-bank))
 !   ATTributes:
 !   -----------
 !
 !COL ATT-name FMT Min    Max     !Comments
 !
 !----- Beam polarization and other quantities averaged over all bunches
 !       and over 1 min. of data taking
 !    The time-stamp corresponds to the middle of the laser-on interval (LOI),
 !    since this period is sensitive to the beam polarization.
 !
 !---------------------    Time-stamp  --------------------------------
 1   UNIXTIME        I -INF +INF  ! Unix time, bits 16 - 31
 2   UNIXTIME        I -INF +INF  ! Unix time, bits  0 - 15
 !-------------------------------------------------------------------
 3   polall     I -INF +INF       ! transverse beam polarization, all bunches,
                                  ! *100 (40.33% = 4033)
 4   polncol    I -INF +INF       ! transverse beam pol., pilot bunches, *100
 5   polcoll    I -INF +INF       ! transverse beam pol., colliding bun., *100
 6   perrall    I -INF +INF       ! error on transv. beam pol., all bun., *100
 7   perrncol   I -INF +INF       ! error on transv. beam pol., pilot bun.,*100
 8   perrcoll   I -INF +INF       ! error on transv. beam pol., coll. bun.,*100
 !--------------------------------------------------------------------------

 9   lumi        I -INF +INF      ! luminosity, *100 (40.33% = 4033)
                                  ! (observed TPOL event rate normalized to the
                                  !  expected TPOL event rate, in %)
 10  beamY       I -INF +INF      ! vert. pos. of Compton beam, *1000 (mkm)
 11  beamSY      I -INF +INF      ! vert. size of Compton beam
                                  ! ellipse, *1000 (mkm)
 12  errlumi       I -INF +INF    ! error on luminosity, *100
 13  errbeamY      I -INF +INF    ! error on vert. pos. of Compton
                                  ! beam, *1000 (mkm)
 14  erbeamSY     I -INF +INF     ! error on vert. size of Compton beam
                                  ! ellipse, *1000 (mkm)
 15  onTime     I -INF +INF       ! total measuring time with laser on in msec
 16  offTime    I -INF +INF       ! total measuring time with laser off in msec
 17  Tdelta12   I -INF +INF       ! 8 bits delta1:    time difference, msec
                                  !      middle of LOI - laser_on_start
                                  ! 8 bits delta2:    time difference, msec
                                  !      laser_on_stop - middle of LOI
 18  Tdelta34   I -INF +INF       ! 8 bits delta3:    time difference, msec
                                  !      laser_off_start - middle of LOI
                                  ! 8 bits delta4:    time difference, msec
                                  !      laser_off_stop - middle of LOI
 !--------  Transverse polarimeter status information  ------------------
 19  DAQup      I    0     1      ! 0 - DAQ is down
                                  ! 1 - DAQ programs are running
```

```
20  DAQactiv  I -INF +INF       ! 2 - online pol. measurement is active
                                ! 1 - DAQ is taking polarization data,
                                !     but the data might be compromised
                                !     (e.g. because some tuning is going on)
                                ! 0 - online pol. measurement not active
                                !-1 - DAQ claims to take polarization data,
                                !     but something is wrong
                                !-2 - DAQ is taking polarization data,
                                !     but someone is doing tests
                                !-3 - DAQ is taking polarization data
                                !-9 - DAQ is down
21  Autopil   I -INF +INF       ! 2 - autopilot has full control
                                ! 1 - autopilot is partially enabled
                                ! 0 - autopilot (AP) is not active
                                !     (or DAQ is down)
                                ! < 0 someone is doing tests:
                                !-1 - test flag active, AP disabled
                                !-2 - test flag active, AP partially enabled
                                !-3 - test flag active, AP fully enabled
                                !-9 - DAQ is down
22  runNum  I -INF   +INF       ! 0 - data are not recorded permanently
                                ! >0  run number of the data which are
                                !     currently being recorded
                                ! NOTE!!! a run number may be assigned even
                                ! if no polarization data are collected
                                ! (e.g. for laser measurements)
                                !-9 - DAQ is down
23  runType  I -INF   +INF      ! 0 -   data are not recorded permanently
                                ! 1 -   beam polarization measurement
                                ! 2 -   luminosity optimization
                                ! 3 -   beam tilt measurement
                                ! 4 -   beam focus measurement
                                ! 5 -   table centering
                                ! 6 -   detector calibration
                                ! 21 -  light polarization measurement
                                ! 22 -  mirror optimization
                                ! 101 - test run
                                ! -1 - unknown
                                ! -9 - DAQ is down
24  collim  I -INF   +INF       ! 0 - collimators are closed
                                !     (TPOL ready for injection or beam dump)
                                ! 1 - collimators are open
                                !     (TPOL ready to take data)
                                !<0 - collimators are in a special state:
                                !-1 - collimators are about to be opened
                                !-2 - collimators are about to be closed
                                !-7 - collimator status is undefined
                                !-8 - collimator status is unknown
                                !-9 - DAQ is down
END TABLE
```

LPLA keep bank

```
---------------------------------------------------------------------------
 !       BANKname  BANKtype       !Comments
 !
  TABLE   LPLA     B16            ! Polarization_Longitudinal_Averaged_data
                                  !     measurements and related info
                                  !     (non-event bank (KEEP-bank))
 !   ATTributes:
 !   -----------
 !
 !COL ATT-name FMT Min    Max    !Comments
 !
 !
 !----- Beam polarization and other quantities averaged over all bunches
 !      and over 1 min. of data taking
 !   Note: LPOL laser is pulsed. Measurement is average of many pulses
 !
 !---------------------   Time-stamp  ---------------------------------
 !
 1   UNIXTIME       I -INF +INF   ! Unix time, bits 16 - 31
 2   UNIXTIME       I -INF +INF   ! Unix time, bits  0 - 15
 !
 !---------------------   Polarization  -------------------------------
 !
 3   LPOL_pol     I -INF +INF     ! longitudinal beam polarization, all bunches,
                                  ! *100 (50.33% = 5033)
 4   LPOL_err     I -INF +INF     ! error on longit. beam pol., all bun., *100
 !
 !---------------------  Longitudinal polarimeter status information
 !
 5   LPOL_DAQ       I    0   +INF   ! HERMES Run Status:
                                  ! 0 or 1 - idle
                                  ! 2 - running
                                  ! 3 - paused
 6   LPOL_run       I    0   +INF   ! HERMES Run Number

 END TABLE
```

Status of
LPTB, LPTA, LPLB, LPLA
in spring 2003

- **Bunch polarization and error on polarization**

$\Downarrow$

filled (**LPTB, LPLB**)

- **Other quantities** (**in LPTA, LPLA**)

$\Downarrow$

test fillings in various stages

or

not filled

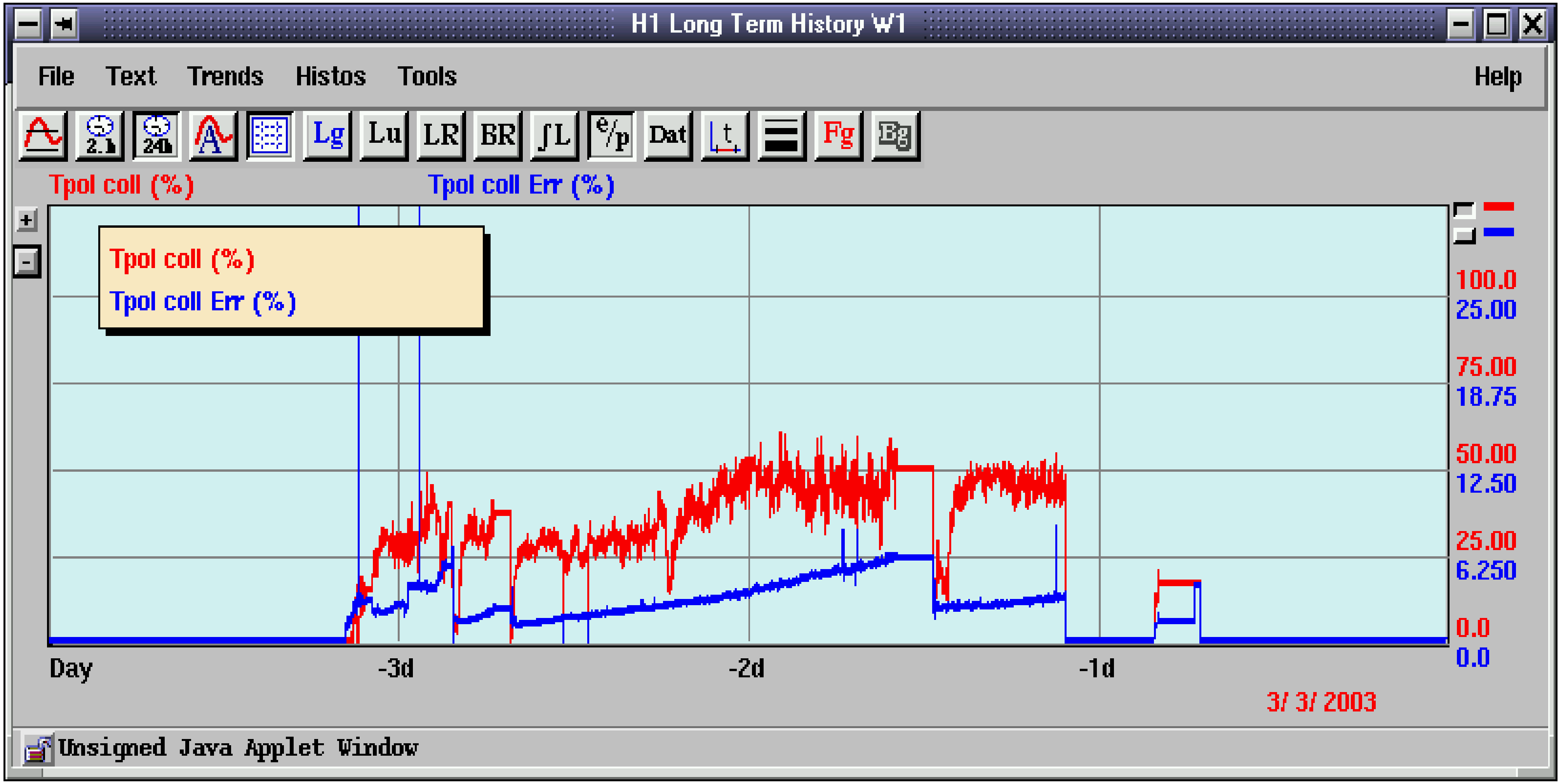
Print of LPTB bank

```
LPTB:  Length, table header   444        1   442
Unixtime   1046613404 ==> 2003/03/02  13:56:44
  This is GMT time, add 1 (2) hours for Hamburg Winter (Summer) time...
EVDTIM:  Run&ev. 342776  4  Unixtime is  1046613515   Date&Time  30302  145835
Transv. Polarization (1min aver.) of all bunches, in %
  1- 10:  622.86 621.01  70.95  94.97  11.70  70.03  46.07  11.75  10.28  52.22
 11- 20:   55.36 110.30  44.51  44.31  41.68 620.72  20.89  38.77 621.39  26.39
 21- 30:   36.30  21.85  78.30  64.27  40.05 643.18  34.75  55.31  25.32 630.33
 31- 40:    6.30 644.06  25.42  85.31  73.89  50.76  73.94 627.52  49.77 654.14
 41- 50:   81.03 101.30  28.91  31.76  53.78  50.55  38.96  41.72  56.60  60.67
 51- 60:   70.50  70.62  61.90  35.88  55.47  34.28  94.29  87.52 136.80 100.20
 61- 70:   91.08  40.90  97.38   0.00   0.00   0.00   0.00   0.00   0.00   0.00
 71- 80:  634.79  98.38  13.70 626.85  69.22 614.54  49.00  20.72 648.01  61.86
 81- 90:   12.34  91.73  31.52  55.42  62.54  99.78  39.87  71.20 123.59 651.05
 91-100:   22.81  17.38  66.28   5.58 105.90 101.30   7.73  41.43  42.67  40.90
101-110:  640.76  69.67 135.10  58.58  57.81   1.83 603.98  30.53 639.04 106.60
111-120:  107.40  92.56  11.63  92.71  14.34  69.43  44.80   6.49  57.19  21.40
121-130:  151.30  56.18  36.51   3.70  66.23   1.57  25.20 100.80 150.60  43.44
131-140:    6.00  95.08  39.66   0.00   0.00   0.00   0.00   0.00   0.00   0.00
141-150:   41.04  28.11  44.34  55.76  99.03  18.92  85.14  87.57  91.00  62.24
151-160:    2.46  34.23   9.31  35.33  38.32 109.20  49.58  77.45  51.44  15.00
161-170:   10.11  43.96  56.50 639.92  69.23  28.92  50.46  30.46  18.55  88.81
171-180:   23.52  69.28  42.11  39.06  58.85  69.33  67.22  10.36  35.79  49.58
181-190:   70.86  62.29  64.81   0.65 101.80  55.54 633.78  29.44  56.78  33.40
191-200:   81.21 120.50  35.29  31.20 627.63  26.15  81.50   3.99  96.42  86.65
201-210:  107.20  98.33  24.15   0.00   0.00   0.00   0.00   0.00   0.00   0.00
211-220:    0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
   and corresponding errors, in %
  1- 10:   48.63  43.79  47.57  39.31  56.08  40.35  39.31  42.59  42.78  34.37
 11- 20:   36.46  32.70  38.85  35.72  41.16  45.59  41.71  46.53  51.38  42.95
 21- 30:   38.99  38.76  37.38  32.90  39.58  41.87  31.54  42.65  37.40  40.47
 31- 40:   46.57  41.55  41.91  36.53  45.84  41.18  41.58  49.83  43.28  34.30
 41- 50:   39.21  40.66  43.84  47.36  37.59  36.53  33.32  34.13  39.99  34.14
 51- 60:   43.35  44.99  47.31  44.07  38.79  38.89  41.22  45.01  45.92  40.45
 61- 70:   46.01  43.19  41.53   0.00   0.00   0.00   0.00   0.00   0.00   0.00
 71- 80:   49.85  39.03  40.91  36.52  42.89  42.22  37.32  40.82  38.10  38.60
 81- 90:   36.98  33.25  34.13  35.96  37.41  33.91  35.20  35.89  44.44  42.24
 91-100:   38.99  38.78  44.18  38.49  37.31  41.71  40.26  30.46  36.99  37.71
101-110:   41.40  40.98  46.12  38.99  42.56  40.22  44.90  42.04  41.62  33.77
111-120:   34.16  32.99  35.73  44.36  32.97  44.87  42.58  34.93  39.19  39.84
121-130:   36.87  34.95  33.69  37.41  41.36  41.37  45.34  38.41  40.62  53.21
131-140:   37.14  40.20  40.41   0.00   0.00   0.00   0.00   0.00   0.00   0.00
141-150:   44.83  39.19  46.65  37.72  42.06  39.17  41.47  49.78  46.28  34.55
151-160:   36.71  33.62  32.60  35.08  30.19  34.48  43.70  35.00  41.56  39.14
161-170:   47.42  36.70  37.14  49.13  48.11  43.59  39.25  35.83  57.87  44.62
171-180:   42.91  48.81  40.46  38.25  43.01  36.95  35.60  36.82  34.03  37.71
181-190:   38.81  35.10  33.34  33.74  34.58  44.80  43.02  37.09  42.64  55.14
191-200:   41.32  36.47  50.21  48.29  33.60  42.78  38.60  35.38  33.57  36.84
201-210:   36.13  43.13  42.39   0.00   0.00   0.00   0.00   0.00   0.00   0.00
211-220:    0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
```

Print of LPTA bank

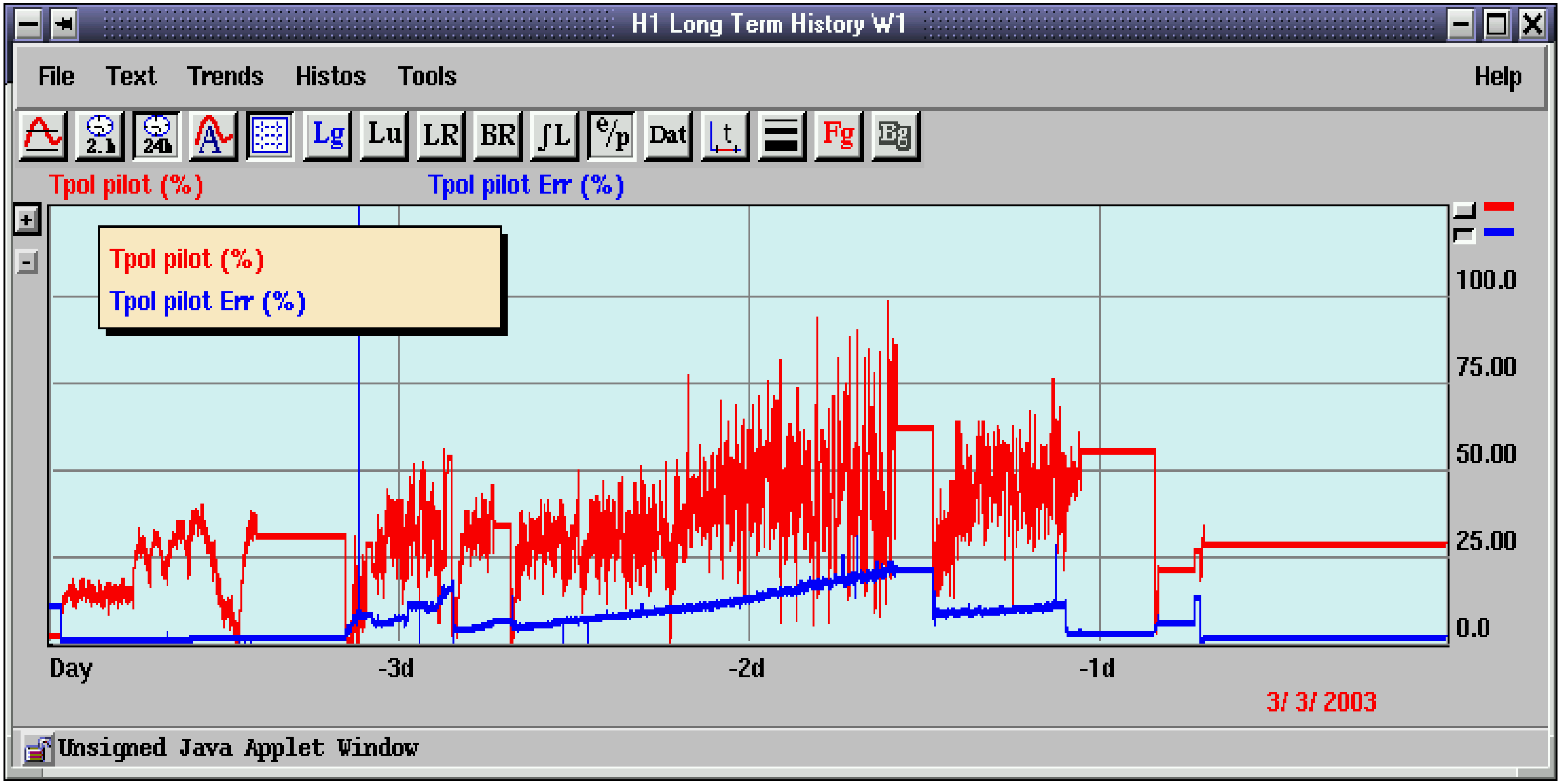
```
LPTA:  Length, table header    26        1    24
Unixtime   1046613404 ==> 2003/03/02  13:56:44
  This is GMT time, add 1 (2) hours for Hamburg Winter (Summer) time...
EVDTIM:  Run&ev. 342776   2  Unixtime is  1046613514  Date&Time 30302  145834

Pol_Transv,    all bunches   4813 +-    476          48.13 +-   4.76 %

Pol_Transv, Coll. bunches   3577 +-    302          35.77 +-   3.02 %

Pol_Transv, pilot bunches   1020 +-      0          10.20 +-   0.00 %

Luminosity        0 +-      0          0.00 +-   0.00 %

Vertical Compt.beam pos.     0 +-       0          0.000 +-    0.000 mkm

Vertical Compt.beam size     0 +-       0          0.000 +-    0.000 mkm

Total time Laser ON/OFF             0            0 msec

Delta1: Middle LOI - LaserONstart            0 msec

Delta2: LaserONstop - Middle LOI             0 msec

Delta3: LaserOFFstart - Middle LOI            0 msec

Delta3: LaserOFFstop - Middle LOI            0 msec

TPOL_DAQup            0    TPOL_DAQactive            0

TPOL_Autopilot            0    TPOL_RunNum            0

TPOL_RunType   1414350379   TPOL_Collimators           7
```

Polarization data from LUMI-server



Polarization studies: last 4 days of data taking in spring 2003

Polarization data from LUMI-server



Polarization studies: last 4 days of data taking in spring 2003

Polarization Data to be stored in DB

1. Bunch average as function of time

$$\frac{\sum L_i P_i}{\sum L_i} = \overline{P}$$ (once/minute)

Sum over: all bunches,
and colliding bunches,
and pilot bunches.

T-banks (LPTT and LPLT) in analogy to LH1T Lumi bank

2. Time average as function of bunch

$$\sum_t L_i P_i = \overline{P}_i$$

1 value per Run for each bunch
or 3 values per Run for each buch
(Run-start, Run-mid., Run-end)

3. Total time and bunch average

1 value per Run (or 3 values)

2& 3: R-banks (LPTR and LPLR) in analogy to LH1R Lumi bank

LH1T bank (printout from Cartl)

Run 342714, Lumi Fill# 3003

```
LH1T:  Length, table header  1166     6   194

Tot_time  Act_time  Int.Lumi     HEAR09   HEAR10    HEAR11
  (msec)    (msec)    (mb-1)
   24554     23828         0   A2FB0000 679FEFFF         0
   27335     26473         0   A2FB0000 679FEFFF         0
   27335     26473         0   A2FB0000 679FEFFF         0
   46835     45294       118   A2FB0000 679FEFFF         0
   57675     55795       130   A2FB0000 679FEFFF         0
   62439     60463       135   A2FB0000 679FEFFF         0
   77004     74563       151   A2FB0000 679FEFFF         0
   85233     82499       187   A2FB0000 679FEFFF         0
   94065     91071       209   A2FB0000 679FEFFF         0
   94842     91814       210   A2FB0000 279FEFFF         0
  104525    101186       234   A2FB0000 279FEFFF         0
  114364    110736       259   A2FB0000 279FEFFF         0
  115770    112102       259   A2FB0000 279FEFFF         0
  124949    120923       260   A2FB0000 279FEFFF         0
  140380    135902       261   A2FB0000 279FEFFF         0
   .......................................................
```

~ 10 sec. interval

How LPTT bank could look

Tot_time (msec)	Act_time (msec)	<P_all> (%)	err (%)	<P_col> (%)	err (%)	<P_pil> (%)	err (%)	HEAR09	HEAR10	HEAR11
24554	23828	...	...	...	...	...	...	A2FB0000	679FEFFF	0
27335	26473	...	...	...	...	...	...	A2FB0000	679FEFFF	0
27335	26473	...	...	...	...	...	...	A2FB0000	679FEFFF	0
46835	45294	...	...	...	...	...	...	A2FB0000	679FEFFF	0
57675	55795	...	...	...	...	...	...	A2FB0000	679FEFFF	0
62439	60463	...	...	...	...	...	...	A2FB0000	679FEFFF	0
77004	74563	...	...	...	...	...	...	A2FB0000	679FEFFF	0
85233	82499	...	...	...	...	...	...	A2FB0000	679FEFFF	0
94065	91071	...	...	...	...	...	...	A2FB0000	679FEFFF	0
94842	91814	...	...	...	...	...	...	A2FB0000	279FEFFF	0
104525	101186	...	...	...	...	...	...	A2FB0000	279FEFFF	0
114364	110736	...	...	...	...	...	...	A2FB0000	279FEFFF	0
115770	112102	...	...	...	...	...	...	A2FB0000	279FEFFF	0
124949	120923	...	...	...	...	...	...	A2FB0000	279FEFFF	0
140380	135902	...	...	...	...	...	...	A2FB0000	279FEFFF	0

....

Polarization changes every 1(5) min. only!

Q: **Should we keep the frequency of LH1T, with 10 sec. change of HV bits?**

or 1 min.? ...

How frequent are polarization banks?

```
                          RUN   342776
                      ===================
EVDTIM                  LPTB time_stamp    EVDTIM                  LPTA time_stamp
-------------------------------------------------------------------------
2.03.03   14:58:35   2.03.03 13:56:34    2.03.03   14:58:34   2.03.03 13:56:44
          14:59:29           13:57:46              14:59:30           13:57:46
          15:00:29           13:58:48              15:00:28           13:58:48
          15:01:30           13:59:50              15:01:32           13:59:50
          15:02:29           14:00:52              15:02:30           14:00:52
          15:04:29           14:01:54              15:05:30           14:03:58
          15:05:31           14:03:58              15:06:30           14:05:00
          15:06:31           14:05:00              15:04:30           14:01:54
          15:07:30           14:06:02              15:07:32           14:06:02
          15:10:31           14:08:06              15:08:32           14:07:04
          15:08:30           14:07:04              15:10:32           14:08:06
          15:11:30           14:09:08              15:11:32           14:09:08
          15:12:31           14:10:10              15:12:31           14:10:10
       ...............................     ..............................
EVDTIM                  LPLB time_stamp    EVDTIM                  LPLA time_stamp
-------------------------------------------------------------------------
2.03.03   14:58:35   2.03.03 13:52:04    2.03.03   14:58:34   2.03.03 13:52:04
          15:01:30           13:57:03              15:01:29           13:57:03
          15:06:31           14:02:03              15:06:30           14:02:03
          15:11:31           14:07:02              15:11:32           14:07:02
          15:15:31           14:12:02              15:15:31           14:12:02
          15:21:33           14:17:01              15:21:33           14:17:01
          15:26:32           14:22:01              15:26:32           14:22:01
          15:31:33           14:27:01              15:31:34           14:27:01
          15:35:33           14:32:00              15:35:34           14:32:00
          15:41:34           14:37:00              15:41:34           14:37:00
       ...............................      .............................
```

once / min. !

once / 5 min. !

Polarization data in the DB

Once decision is taken,

simple SW addition to TCL RunEnd Job,

to produce NDB-banks:

LPTT, LPTR and LPLT, LPLR

from keep data banks:

LPTA, LPTB and LPLA, LPLB