Post Mortem Workshop

Session 4 Data Providers, Volume and Type of Analysis

Beam Instrumentation

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January 2007

Overview

- How do BI proceed with a new system
- PM interface specification document
- Systems specified
  - Beam Position Monitor
  - Beam Loss Monitor
  - Fast Ring Beam Current Transformer
  - Slow/Fast Synchrotron Light Monitor
  - Tune Measurement
- Still to do
- Conclusion

How do BI proceed

- Post-mortem functional specification (OP/ABP/CO/BI). Doc. approved in EDMS.
- PM interface specification document
- PM structure requested from AB-CO
- PM software interface delivered by AB-CO
- Low-level software implementation in FESA control servers

PM interface specification document

- PM requirement from the PM specification
- PM structure to be sent to the PM server
  - Default fields (common for all systems)

SELF EXPLANATORY

```
runNb
pmFreezeStamp       [UTC timestamp CTIM PM freeze event, jitter < 1 millisecond]
acqStamp            [UTC Last acquisition timestamp]
analysisResult      [First order pre-analysis of the PM data including the hardware status]
                    ⇨ 0:DATA OK 1:UNTESTED 2:WARNING 3:ALERT 4:HW PROBLEM
analysisResultDescription
```

  - Data (contains the full information, ready to be analyzed)

```
B
L
M
        long long orbitTurnStamp[1024]
        float H/V orbitPosition[18][1024]
        long long turnStamp[1024]
        float H/V turnPosition[18][1024]
        string bpmNames[18]
        string unit
        int unitExponent
```

- PM data volume
- PM buffer type and triggering
- Other : Data display example, pre-analysis

Beam Position Monitor

PM Requirement

(1) Horizontal / Vertical beam positions turn by turn
over a total of the last consecutive 1024 turns

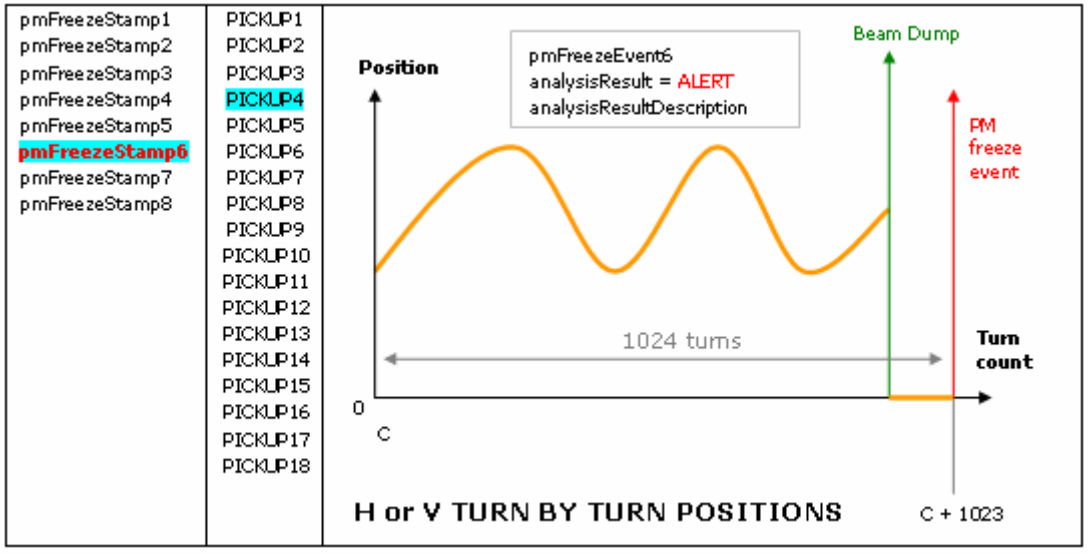
(2) Horizontal / Vertical average closed-orbit positions
over the last 9 seconds (last 1024 closed orbits)

PM Data Volume

~320 Kbytes per front-end computer
~20 Mbytes for the 64 FECs (>1000 pickups)

PM Buffer

Hardware



PMD Viewer Example

Beam Loss Monitor

PM Requirement

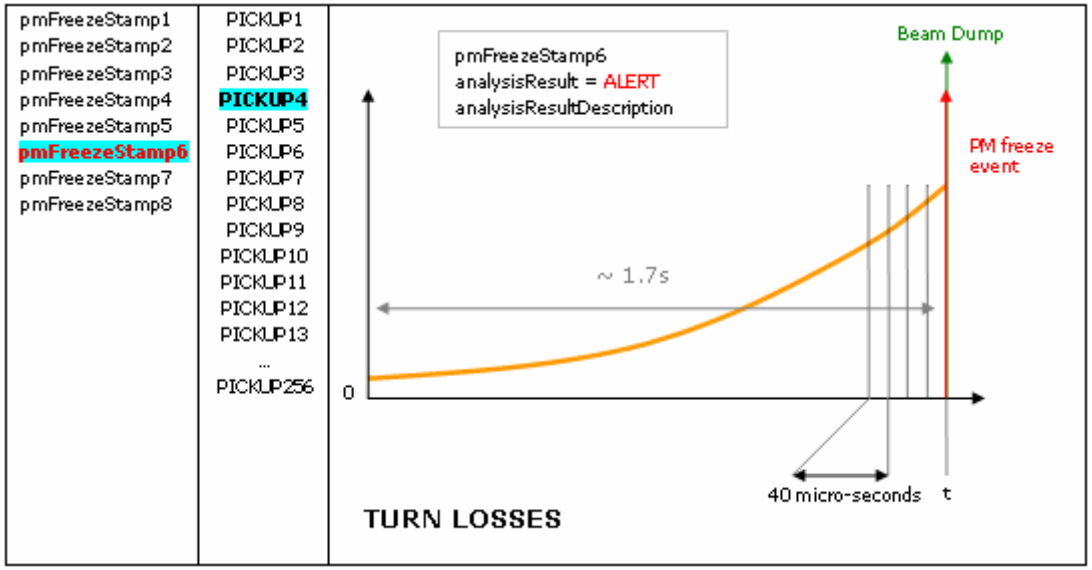
(1) Last 1024 turn losses for each BLM
(2) Last 1024 multi-turn losses for each BLM

PM Buffer

Hardware

PM Data Volume ⚠

~78 Mbytes per front-end computer
~2 Gbytes for the 25 FECs (>4000 pickups)



PMD Viewer Example

Fast Ring Beam Current Transformer

PM Requirement

(1) **Turn by turn, bunch by bunch intensities**
for the last 227 turns
(2) **Turn by turn total intensities**
over the last 1024 turns
(3) **Bunch by bunch life time**
last evaluation
(4) **Beam lifetime evolution**
over the last 100 seconds

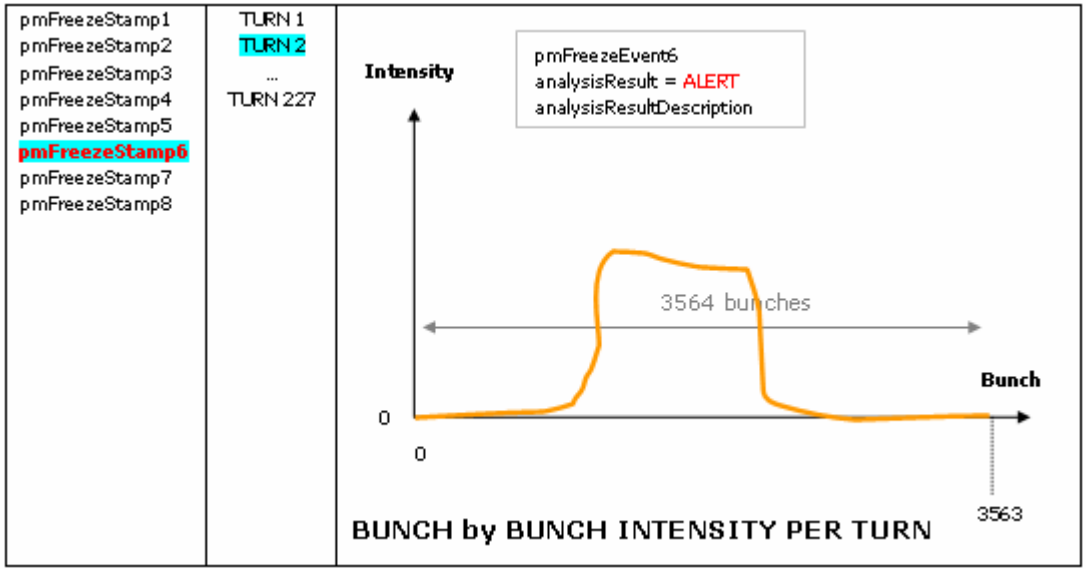
PM Buffer

Hardware

PMDViewer Example

PM Data Volume

~3.3 Mbytes per front-end computer
~13.2 Mbytes 2 FECs for each beam
[1 operational & 1 spare]



Slow Camera Synchrotron Light Monitor (BSRT)

PM Requirement

(1) Horizontal / Vertical beam sizes
acquired every 100 ms over the last 10 seconds

(2) Horizontal / Vertical beam positions
acquired every 100 ms over the last 10 seconds

(3) Horizontal / Vertical beam profiles
acquired every 100 ms over the last 10 seconds

(4) Beam image
acquired every 100 ms (last acquisition before dump)

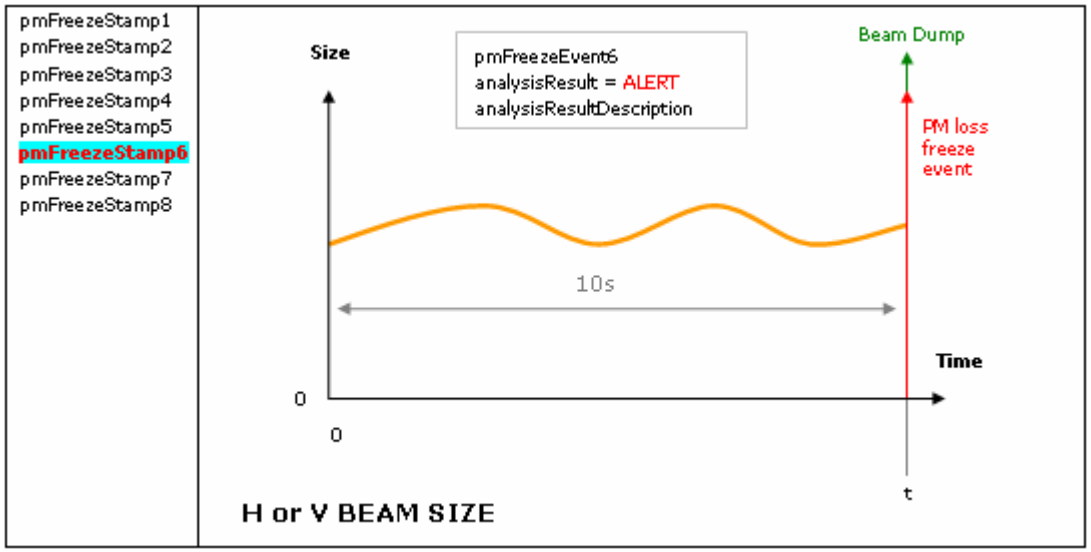
PM Data Volume

~350 Kbytes per front-end computer
~700 Kbytes 1 FEC for each beam

PM Buffer

Software

PMDViewer Example



Fast Camera Synchrotron Light Monitor (BSRT)

PM Requirement

(1) H/V bunch by bunch beam sizes
acquired every minute (last 10 min acquisition before dump)

(2) H/V bunch by bunch beam positions
acquired every minute (last 10 min acq. before dump)

(3) H/V bunch by bunch beam profiles
acquired every minute (last acq. before dump)

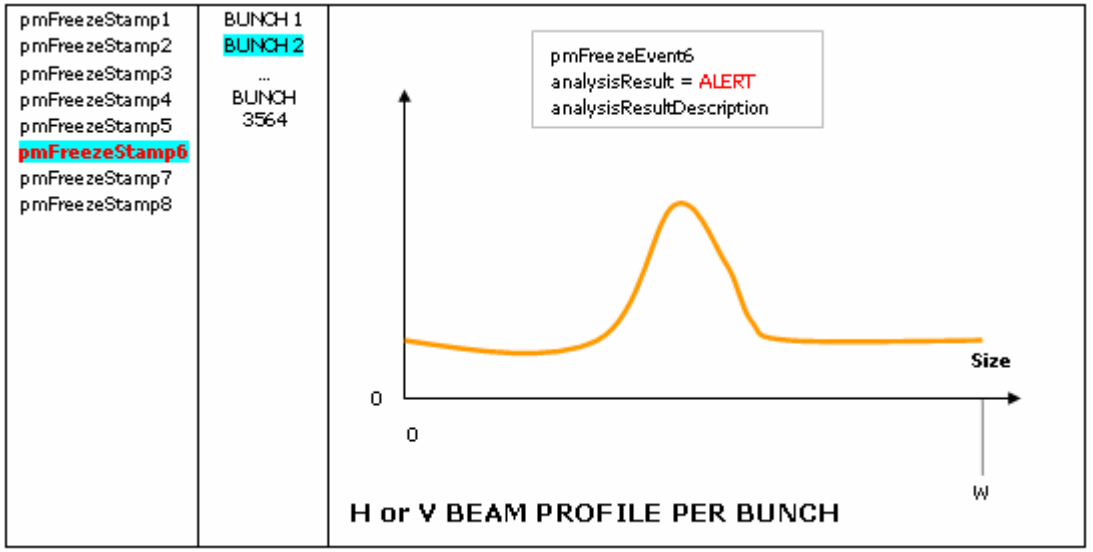
PM Data Volume

~17 Mbytes per front-end computer
~34 Mbytes 1 FEC for each beam

PM Buffer

Software

PMDViewer Example



Tune Measurement

PM Requirement

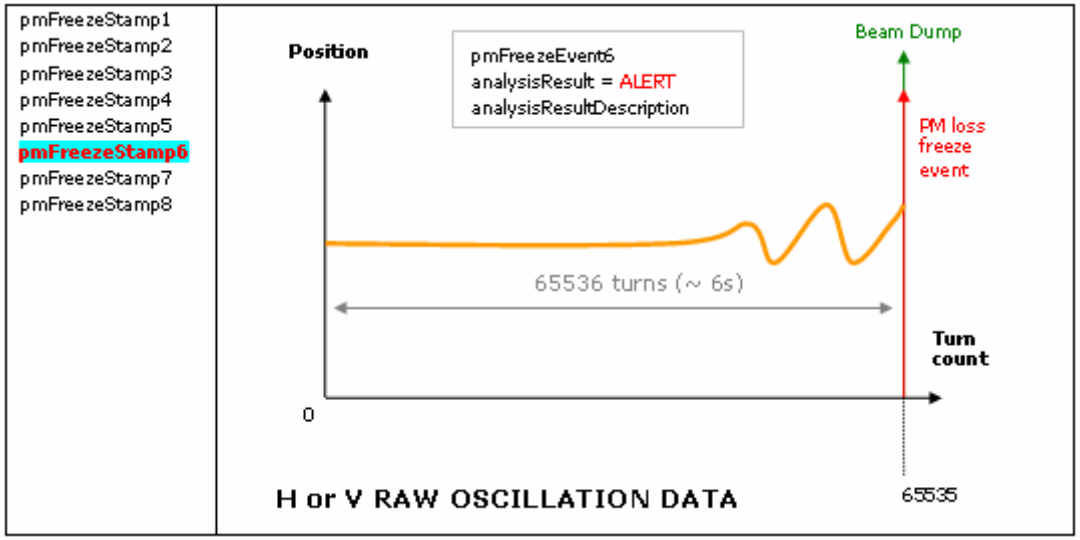
(1) The last 100 H/V tune measurements
calculated over N turns. N is set by the user
(2) The last 100 measurement time stamps
(3) The last 100 N values used for the tune calculation
(4) The last 65536 turns of raw H/V oscillation data

PM Buffer

Software/Hardware

PM Data Volume

~1 Mbytes per front-end computer
~2 Mbytes 1 FEC for each beam



PMDViewer Example

Still to do

- Beam Current Transformer DC
- Abort Gap Monitor
- PLL Tune and Measurement System
- Post-Mortem for dump line instrumentation?

Conclusion

- Things might change in the coming months
- So far, BI has no requests for the post-analysis beside the plot
- BI maintains the website LHC Instrument and Diagnostic Software (LIDS) with instrument uses including post-mortem
- Tests done with the first PM interface provided by CO
  - PM ready to be tested on 20 LHC crates (ex: scalability test) and…
  - …On 100 LHC crates from June/July

First Test

- PM data pushed by a FESA control server to a local PM server
- Only one FESA device
- analysisResult simulated (white/green/yellow/red)