HCAL → CMS DQM

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HCAL ROC
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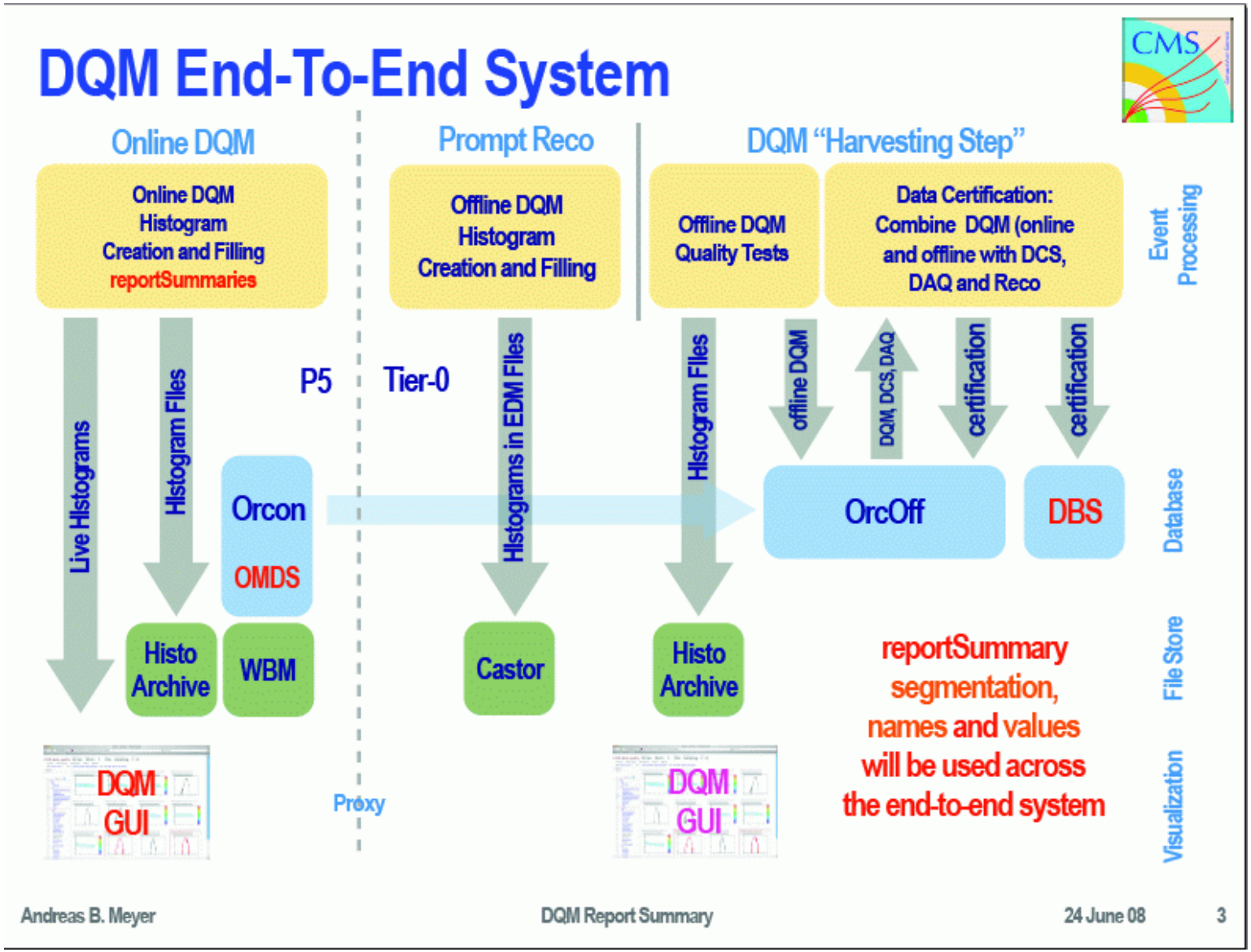
Overview of CMS DQM



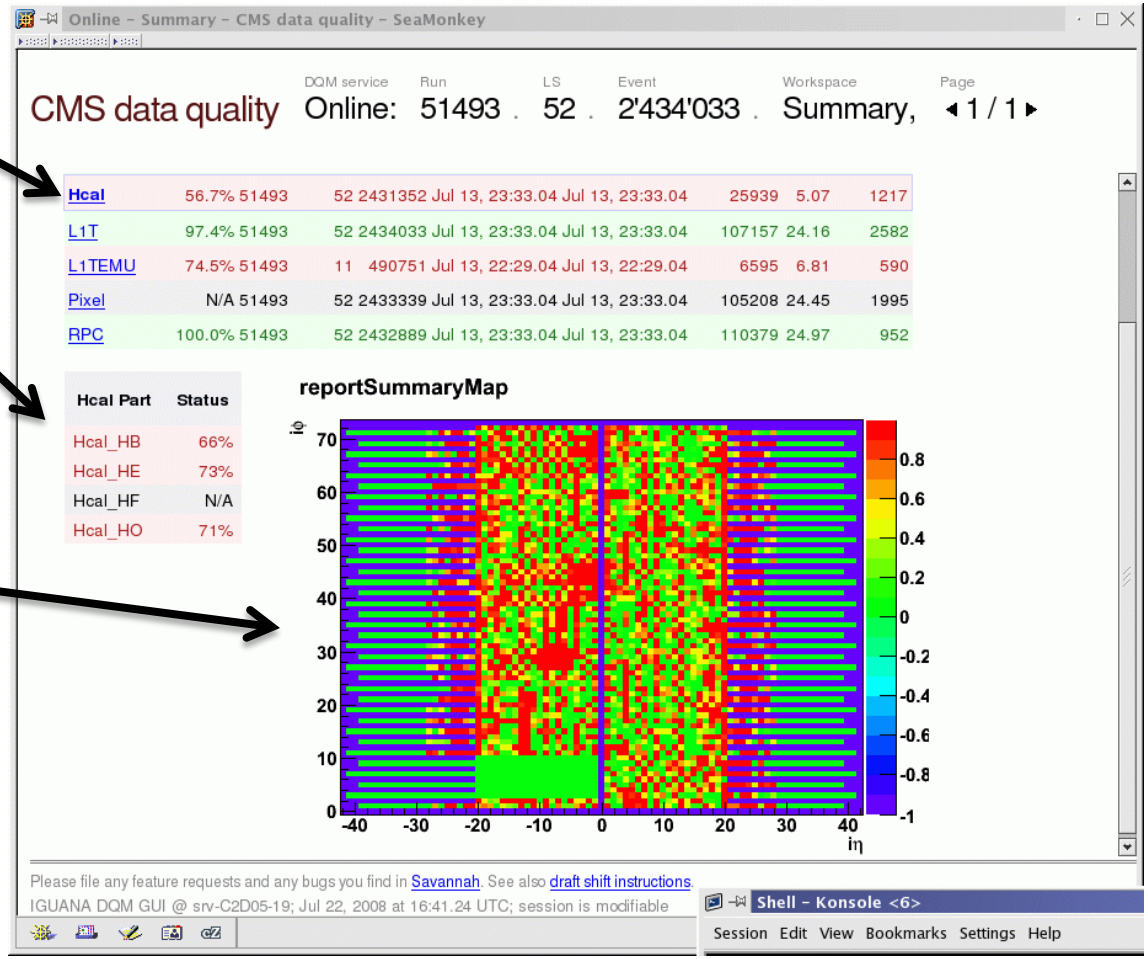
Online DQM Report Summary

One global quality flag (floating point [0,1])

Collection of quality flags per subdetector

2D summary histogram

Report summary is written and archived in root files, once per run (or every 30s)



Online HCAL Report Summary

HB, HE, HO, HF are reported on one histogram

Difficult to see which subdetector has problems

Quality Vals are reported for each subcomponent

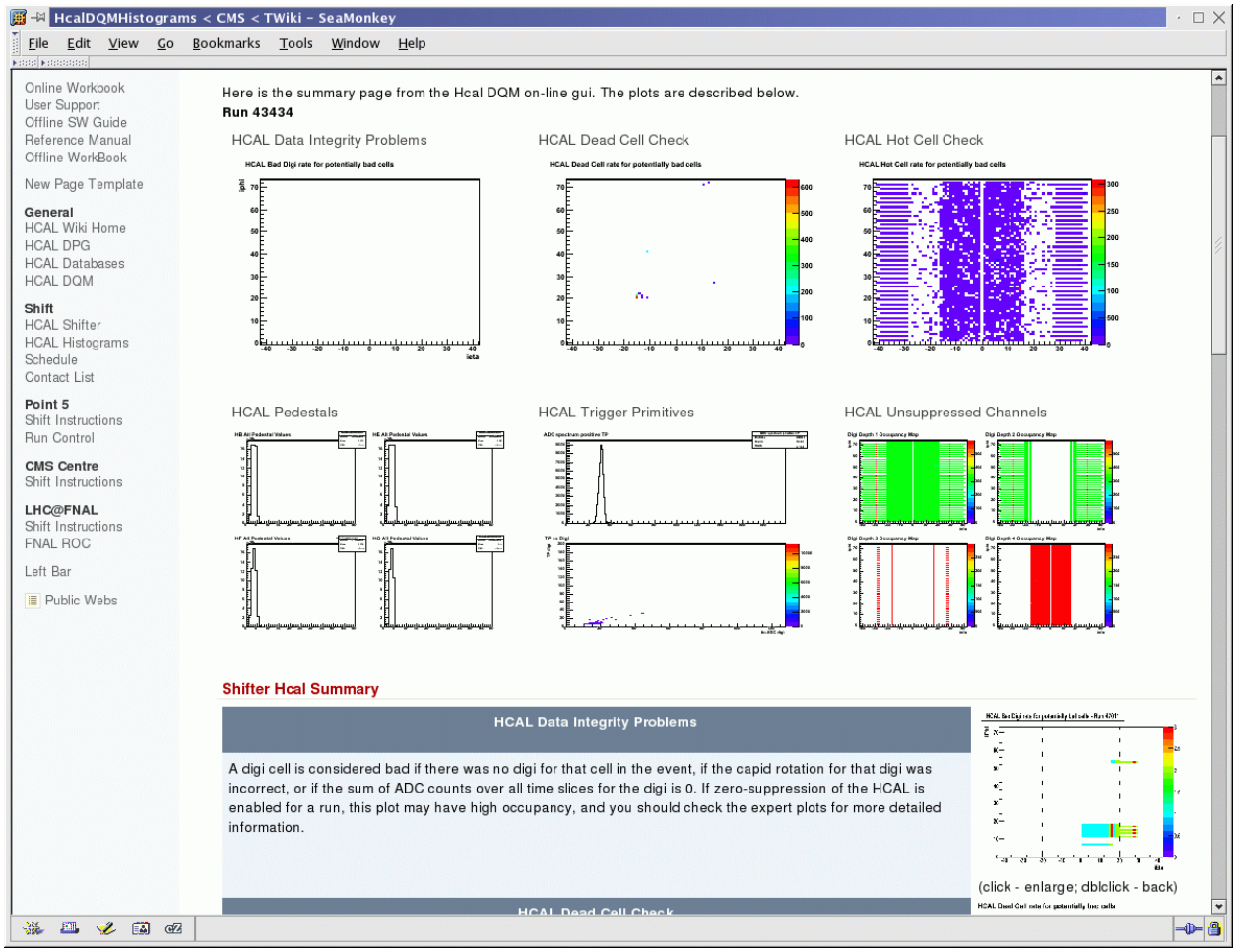
Specify how these are determined…

Combine the Vals into one Quality flag for the run

Extract this information so that it can be used in the Data Certification algorithm…

Shifter Instructions

Nice structure…
Same look and feel as other systems



Need to fill in the instructions

Data Certification

Combine information from DQM+DCS+DAQ

```
    Run          |--------------1---------------
    File         |-----1-----|---2---|---3---|-
    Run Section|-1-|-2-|-3-|-4-|-5-|-6-|-7-|-

    DAQ          |-1-|-1-|-1-|-1-|-1-|-1-|-1-|-

    DCS-HB       |-1-|-1-|-1-|-1-|-0-|-0-|-1-|-
    HB           |-1-|-1-|-1-|-1-|-1-|-1-|-1-|-

    DCS-HO       |-1-|-1-|-0-|-0-|-0-|-1-|-1-|-
    HO           |-1-|-1-|-0-|-0-|-0-|-1-|-1-|-

    DCS-EB       |-1-|-1-|-1-|-1-|-1-|-1-|-1-|-
    EB           |-1-|-1-|-1-|-1-|-0-|-1-|-1-|-

Returns

    Files        |-----1-----|       |---3---|-
    Run Section|-1-|-2-|-0-|       |-0-|-7-|-
```

One run in many files

Many lumi sections in one file

DCS has finer time granularity

Input to Data Certification

Each subsystem is expected to provide DQM information that will be stored in DBS and used to identify "good runs"

```
Layer 1          Layer 2          Layer 3

HCAL_Global   -  HCAL_HB       -  HCAL_HB_Online
                 HCAL_HB_Val      HCAL_HB_Online_Val
                                  HCAL_HB_Offline
                                  HCAL_HB_Offline_Val
                                  HCAL_HB_DCS
                                  HCAL_HB_DAQ

              -  HCAL_EB
              -  HCAL_HO
              -  HCAL_HF

Flags  [0,1]
Vals   [0,1000]
```

Database information is organized in three layers…

Able to select subcomponent (HB,HO, HE, HF)

HCAL DQM Inputs

We need to specify the *inputs* used by Data Certification and define how they are calculated

Information is being collected at:

http://ncdf76.fnal.gov/~chlebana/CMS/DQM/HCAL/

As we get a better understanding of what we want to do we will update the web page

Eventually move it to a more appropriate area…

HCAL DQM Inputs

Specify algorithms and define thresholds and cut values…

Hot Cell Algorithms

HCAL_HB_Offline_HotCell_Val

Dead Cell Algorithms

HCAL_HB_Offline_DeadCell_Val

DigiMon

HCAL_HB_Offline_DigiMon_Val

HCAL DQM Inputs

<u>Online DQM:</u> ***Specify a quality flag for entire run***

The Quality values (Val) are determined from the results of the Hot, Dead, and Digi monitors.

```
HCAL_HB_Online_Val = HCAL_HB_Online_HotCell_Val  / 3 +
                     HCAL_HB_Online_DeadCell_Val / 3 +
                     HCAL_HB_Online_DigiMon_Val  / 3


if (HCAL_HB_Online_Val > 950) HCAL_HB_Online = 1
```

Offline DQM

<u>Offline DQM:</u> ***Specify quality flags per Lumi Section***

Use same algorithms as online

Need to find out how much data is needed for each check

Identify Lumi Section boundaries and determine data quality for each Lumi Section

Write results to a "Data Certification file"

Offline DQM – Lumi Sections

Can fill *temporary* histograms for each LS
Calculate quality information from the Temp Hists
mean, sigma…
Save quality information as "ntuple" in the same root file

Can determine Data Certification results in same job or run afterwards by accessing root file

Can plot trends

Can compare histograms to reference

Data Certification File

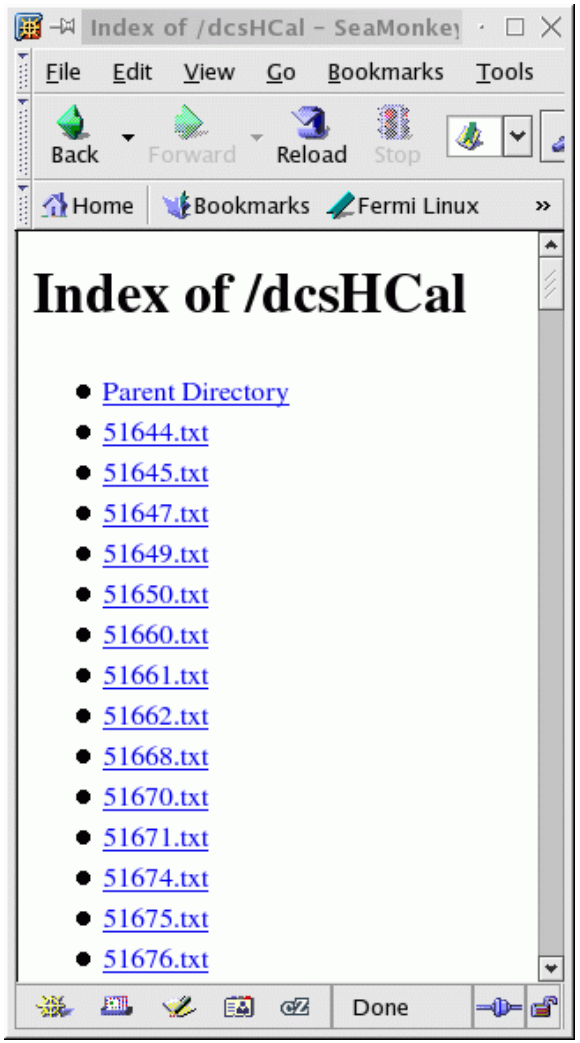
Database is filled using a python script which reads a file of the Data Certification output

```
Run     LumiSection          TagName            TagValue
1       0                    HCAL_Global        1
1       0                    HCAL_HB            1
1       0                    HCAL_HB_Val        1000
...
```

One line per variable, entries for LumiSection=0 refer to the default or starting conditions

Variables are updated only when there is a change in the condition (TagValue changes)

Accessing DCS

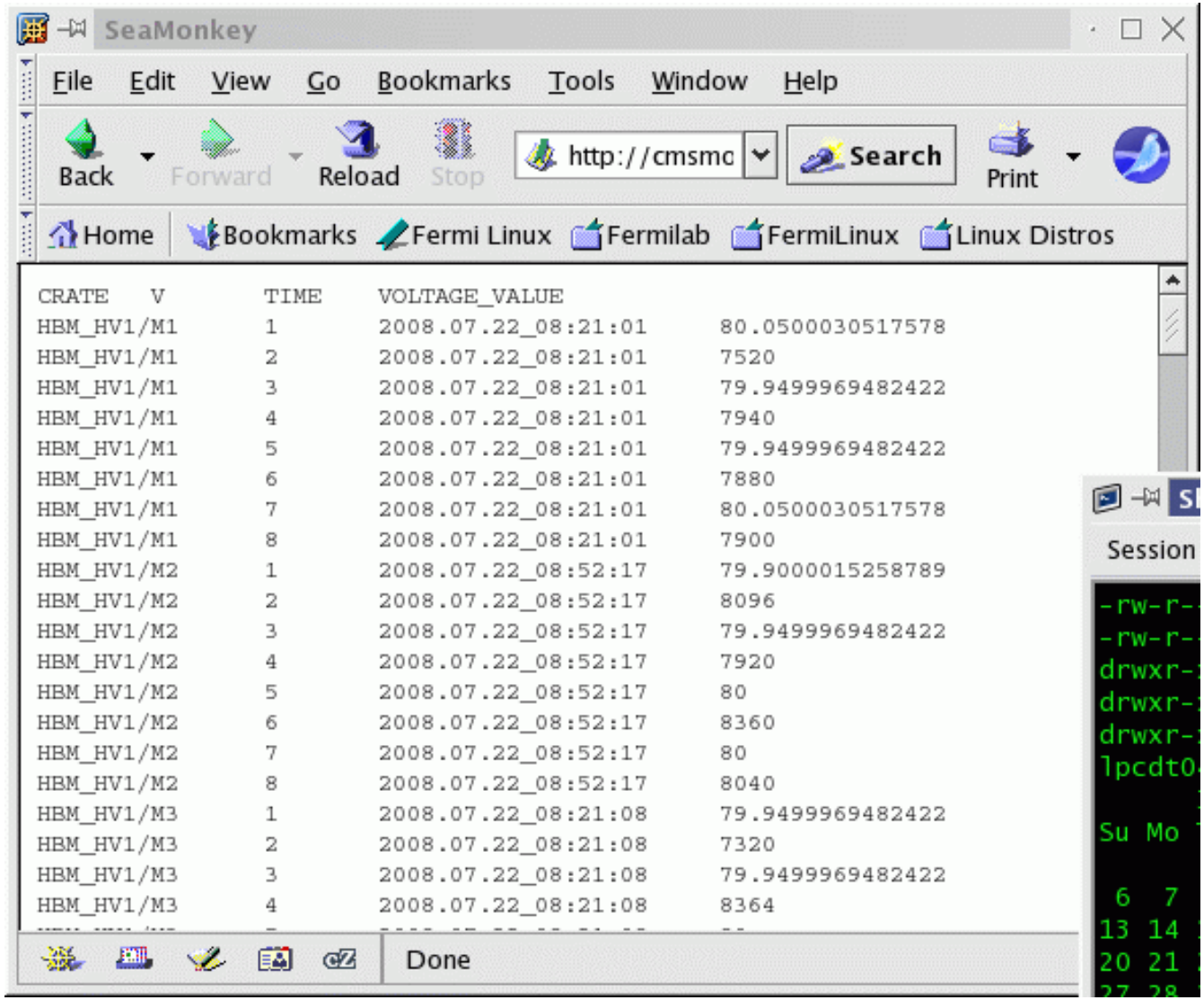


DCS information is written to the database only when there is a change… *difficult to determine the conditions at the start of a run*

Cron job is running on cmsmon which generates a snapshot of the voltages at the start of a run

Can then run a DB query to get the *changes* during the run

Accessing DCS



CRATE V	TIME	VOLTAGE_VALUE	
HBM_HV1/M1	1	2008.07.22_08:21:01	80.0500030517578
HBM_HV1/M1	2	2008.07.22_08:21:01	7520
HBM_HV1/M1	3	2008.07.22_08:21:01	79.9499969482422
HBM_HV1/M1	4	2008.07.22_08:21:01	7940
HBM_HV1/M1	5	2008.07.22_08:21:01	79.9499969482422
HBM_HV1/M1	6	2008.07.22_08:21:01	7880
HBM_HV1/M1	7	2008.07.22_08:21:01	80.0500030517578
HBM_HV1/M1	8	2008.07.22_08:21:01	7900
HBM_HV1/M2	1	2008.07.22_08:52:17	79.9000015258789
HBM_HV1/M2	2	2008.07.22_08:52:17	8096
HBM_HV1/M2	3	2008.07.22_08:52:17	79.9499969482422
HBM_HV1/M2	4	2008.07.22_08:52:17	7920
HBM_HV1/M2	5	2008.07.22_08:52:17	80
HBM_HV1/M2	6	2008.07.22_08:52:17	8360
HBM_HV1/M2	7	2008.07.22_08:52:17	80
HBM_HV1/M2	8	2008.07.22_08:52:17	8040
HBM_HV1/M3	1	2008.07.22_08:21:08	79.9499969482422
HBM_HV1/M3	2	2008.07.22_08:21:08	7320
HBM_HV1/M3	3	2008.07.22_08:21:08	79.9499969482422
HBM_HV1/M3	4	2008.07.22_08:21:08	8364

Using DCS and DAQ Info

Need to specify "good conditions"

If ((HBM_HV1/M1, 1) < 75)

What information from DCS will be used?

Voltage, Current, Temperature

Specify the definition of

HCAL_HB_DCS

What information from DAQ will be used?

Is the detector component in the readout?

Goals for Cruzet IV

Fill in specification

Review and approve by HCAL DPG

Access DCS and DAQ information

Use the information…

Determine DQM info per Lumi Section

Semi-automate the DQM reporting

Provide the Data Certification File

<u>Should identify HCAL DQM contact person…</u>