

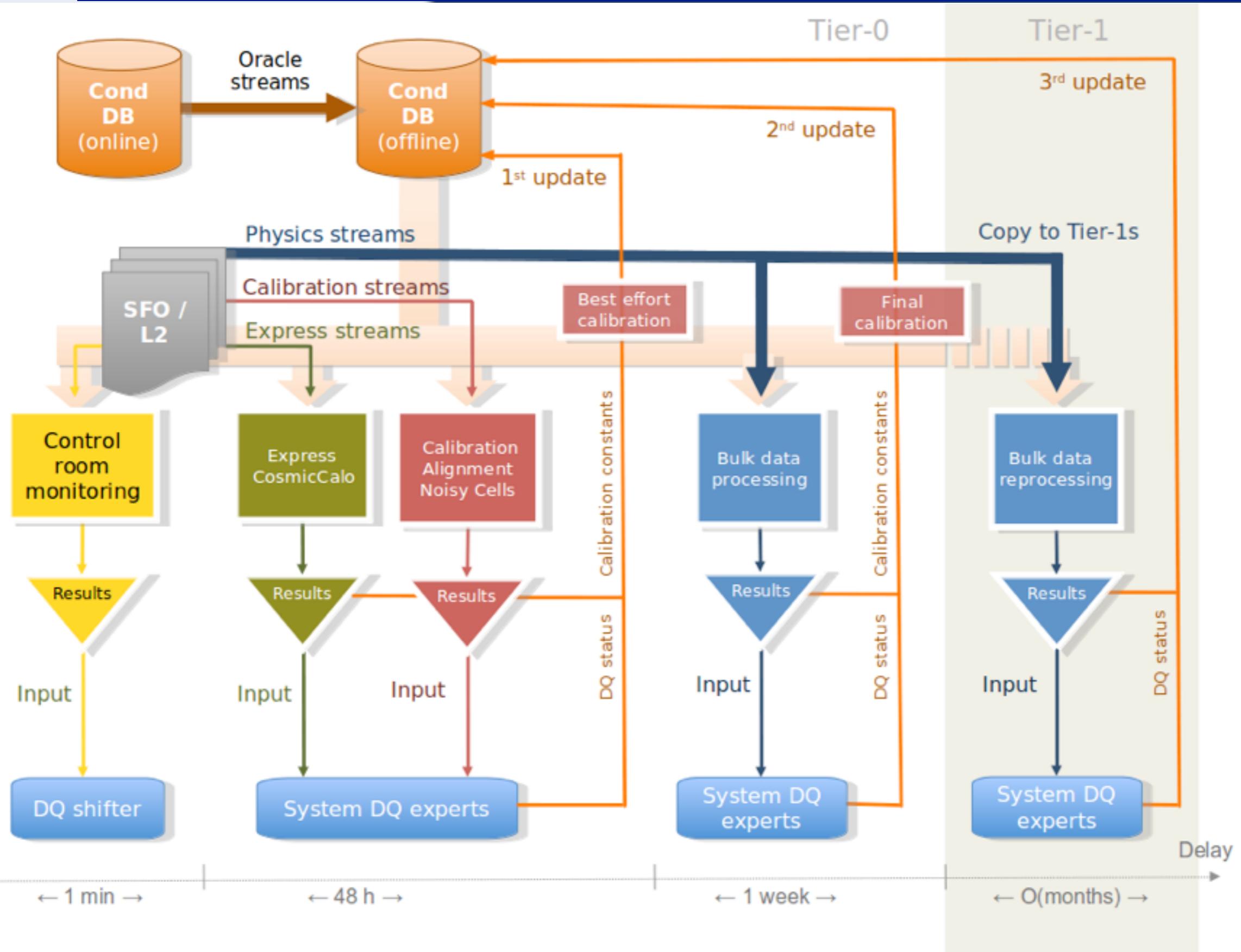
Introduction to DQ monitoring

Elizaveta Shabalina

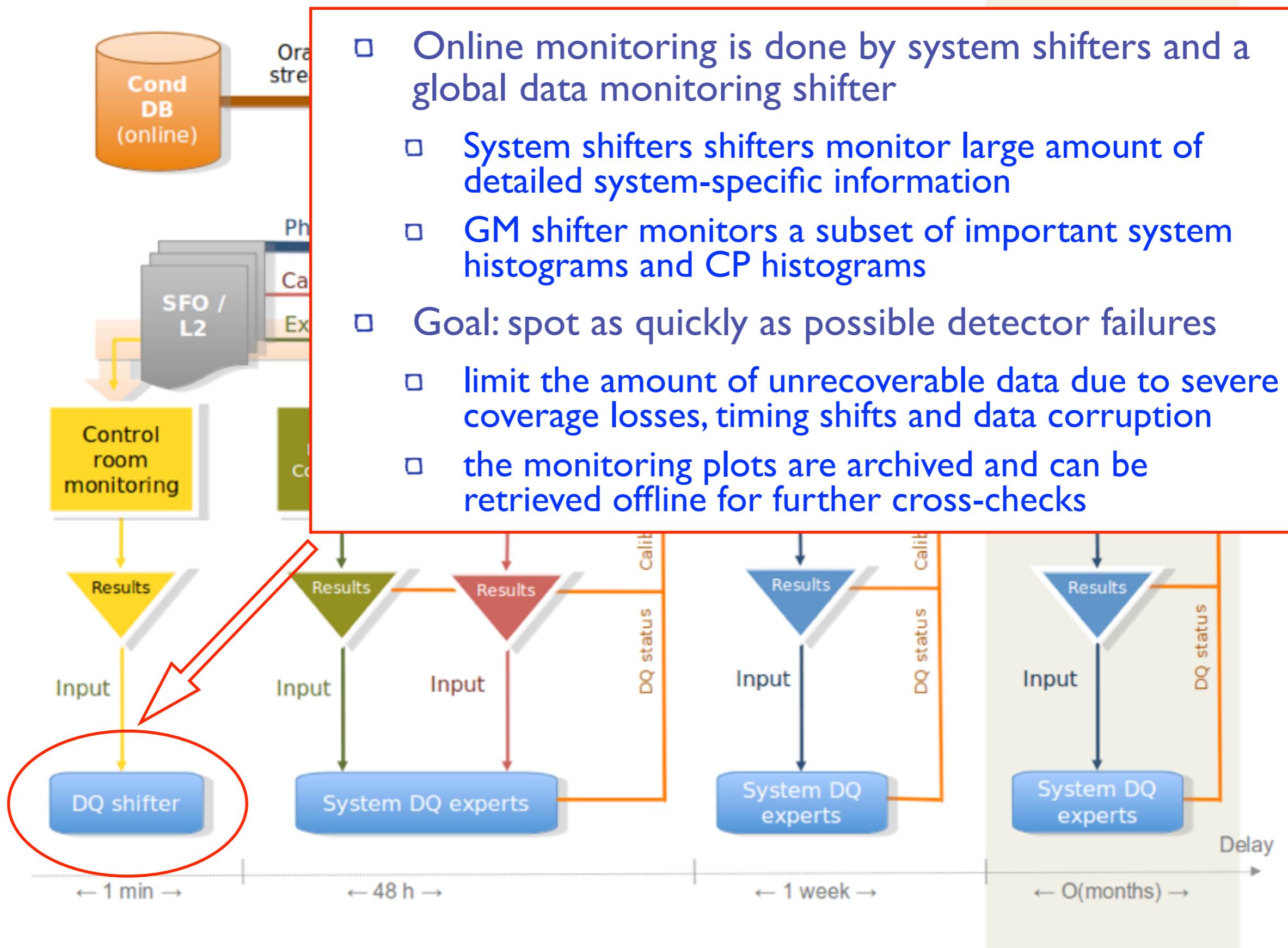
II. Physikalisches Institut, Universität Göttingen

- Data quality assessment in ATLAS
- Main tasks of DQM in ACR
- DQM tools
 - ▶ OHP
 - ▶ DQMD
 - ▶ Trigger Presenter
 - ▶ Event displays
 - ▶ OH display
- Conclusions

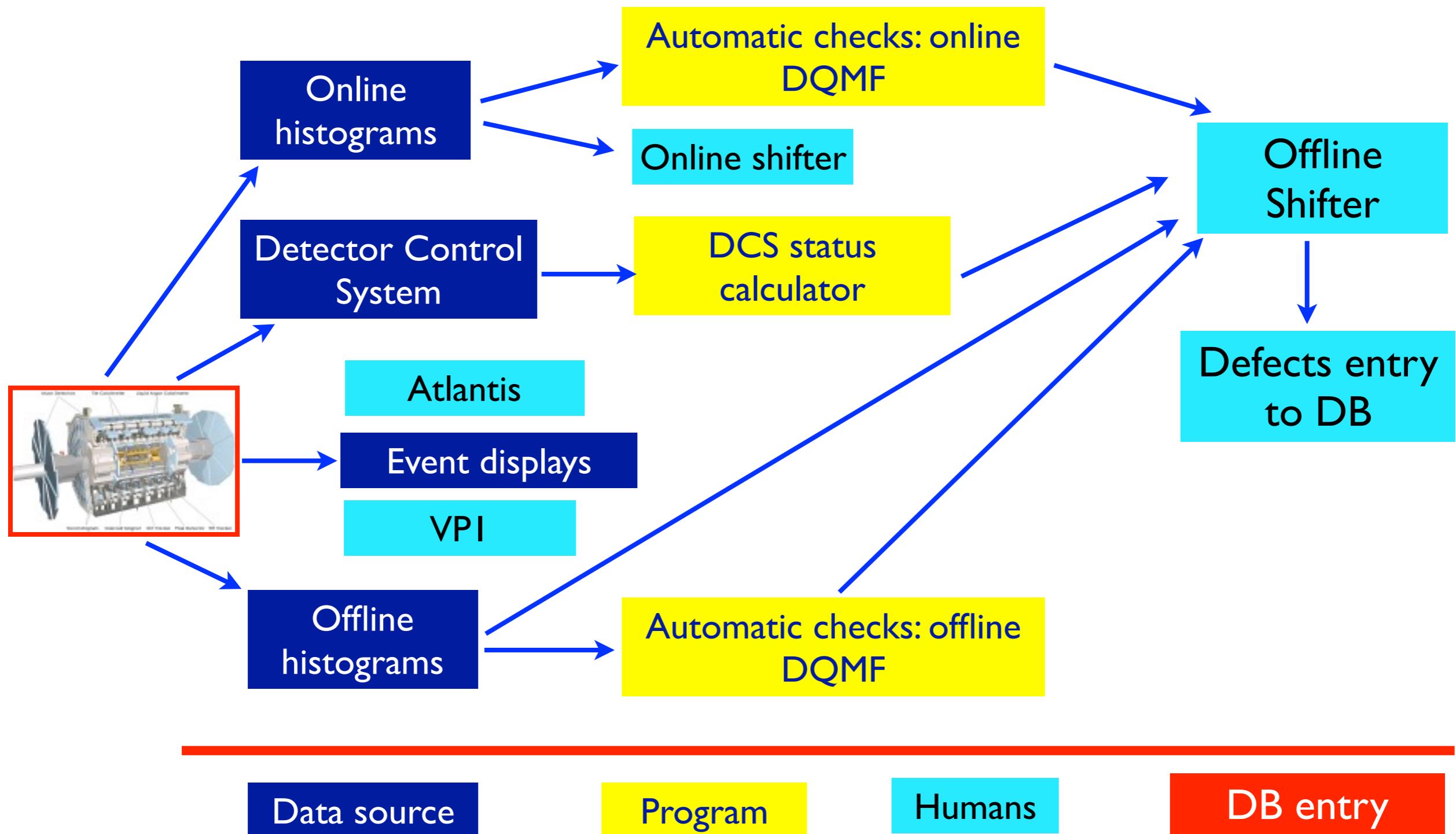
Data quality operation scheme in run I



Data quality operation scheme in run I



Steps in DQ evaluation



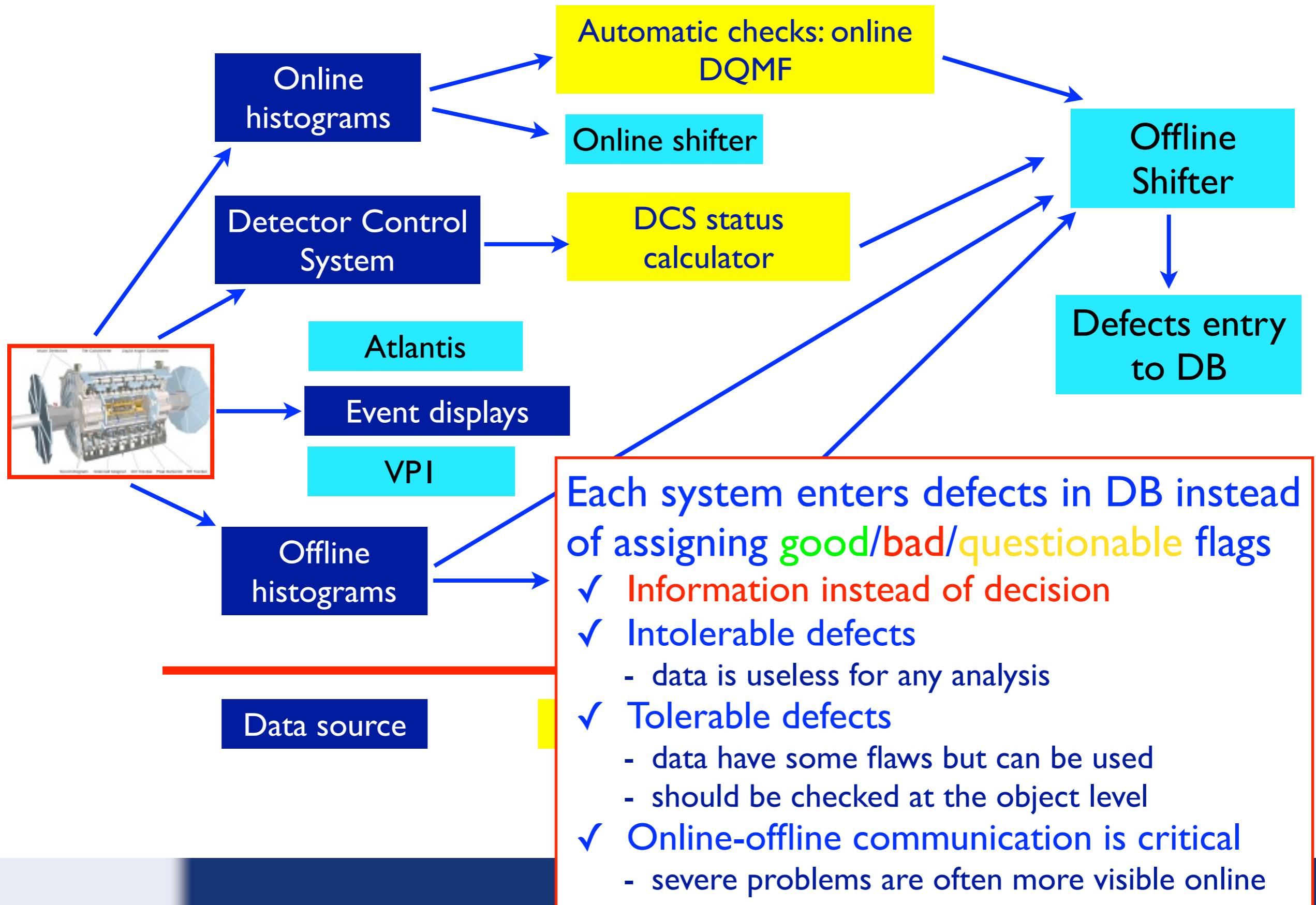
Data source

Program

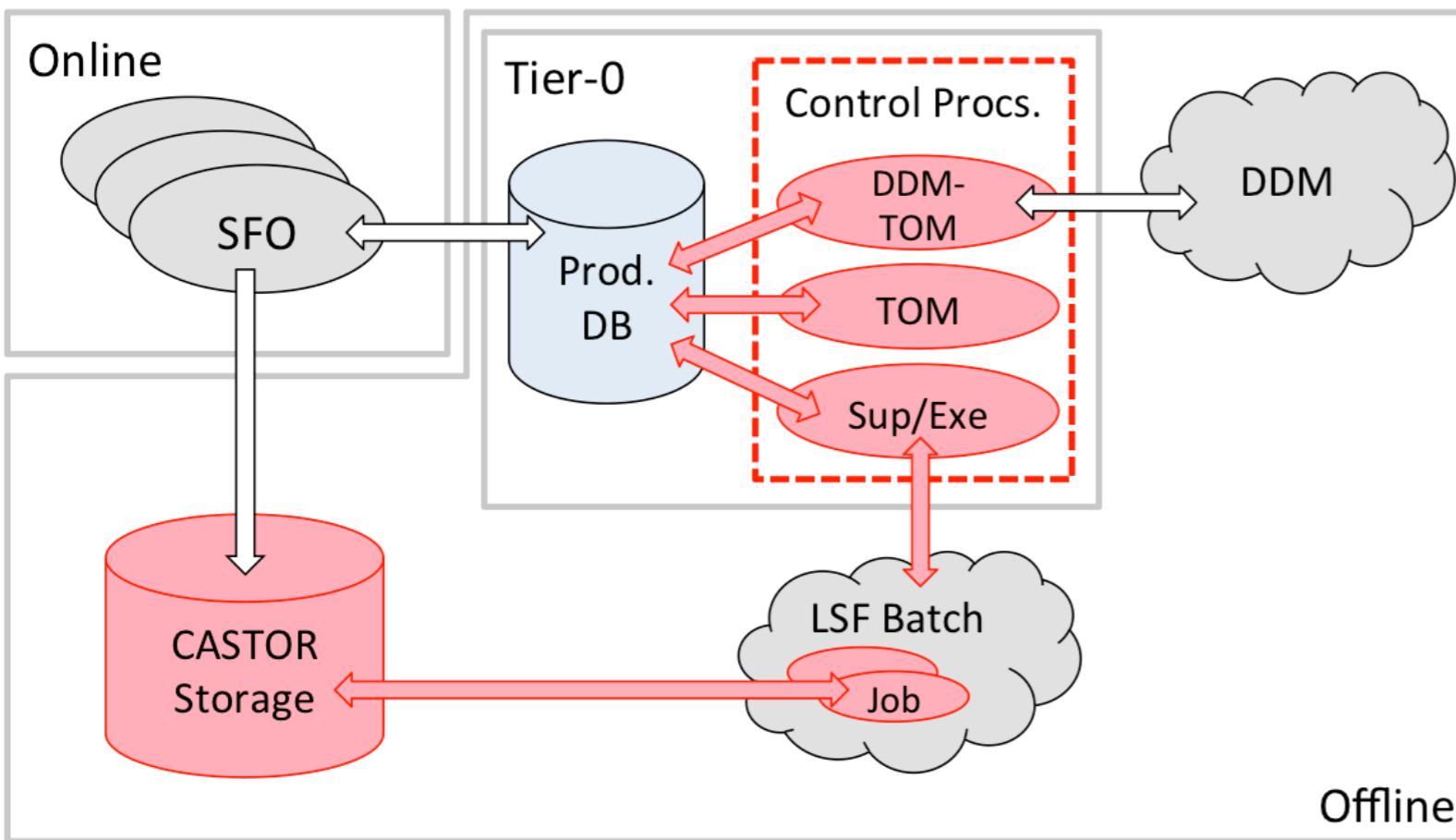
Humans

DB entry

Steps in DQ evaluation



- Watch the correct running of the (online) Data Quality infrastructure at Point I
- Check the most relevant histograms of the systems and Combined Performance Groups and report any problems
- Operate the Event Displays on the projectors in the ACR
- Watch the DQMD (Data Quality Monitoring Display) showing the automatically assigned DQ status flags of all systems
- Watch the luminosity and beam conditions plots in the LHC FSM, and the corresponding DCS alarm panel
- Monitor offline computing (Tier0) (**new!**)
- Document temporary issues, e.g. "application XYZ is frequently crashing and needs to be watched and restarted, bug fix underway" in the Data Quality White Board and log book



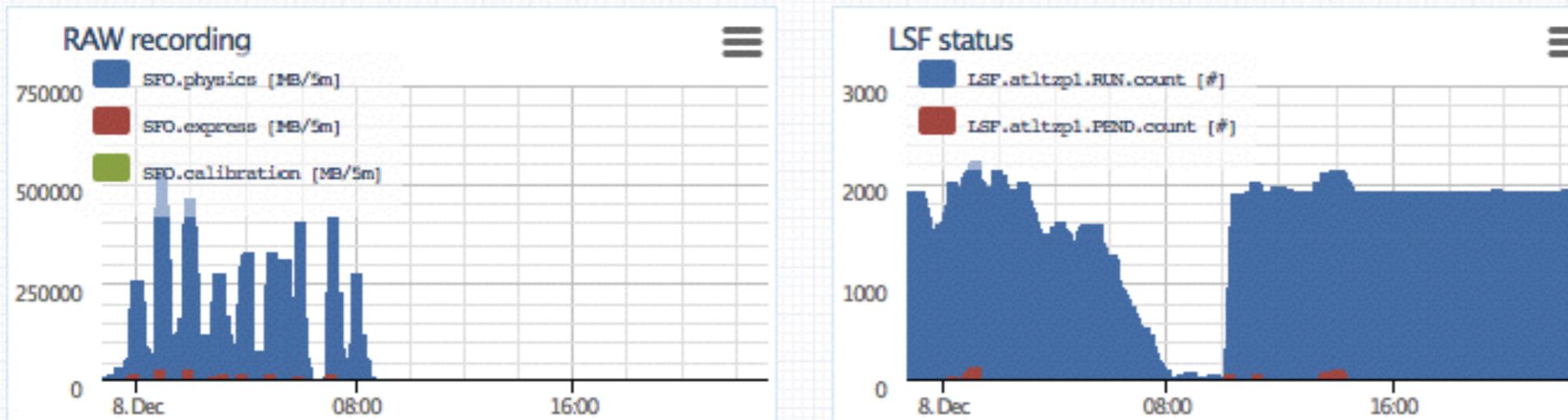
- **Tier-0 responsibilities:**
 - ▶ Archival of RAW data from the SFOs
 - ▶ Management, orchestration, execution of first-pass processing
 - ▶ Registration of all data products, preparation for export to Tier-I centres

The DQ shifter will monitor the basic functionality of the Tier-0 and offline infrastructure:

- ▶ Uptime (“heartbeat”) of Tier-0 control processes
- ▶ Frequency of transfer failures (status of storage system, relevance for online/SFOs)
- ▶ Frequency of job failures

Tools for DQ shifter to perform this task are being discussed

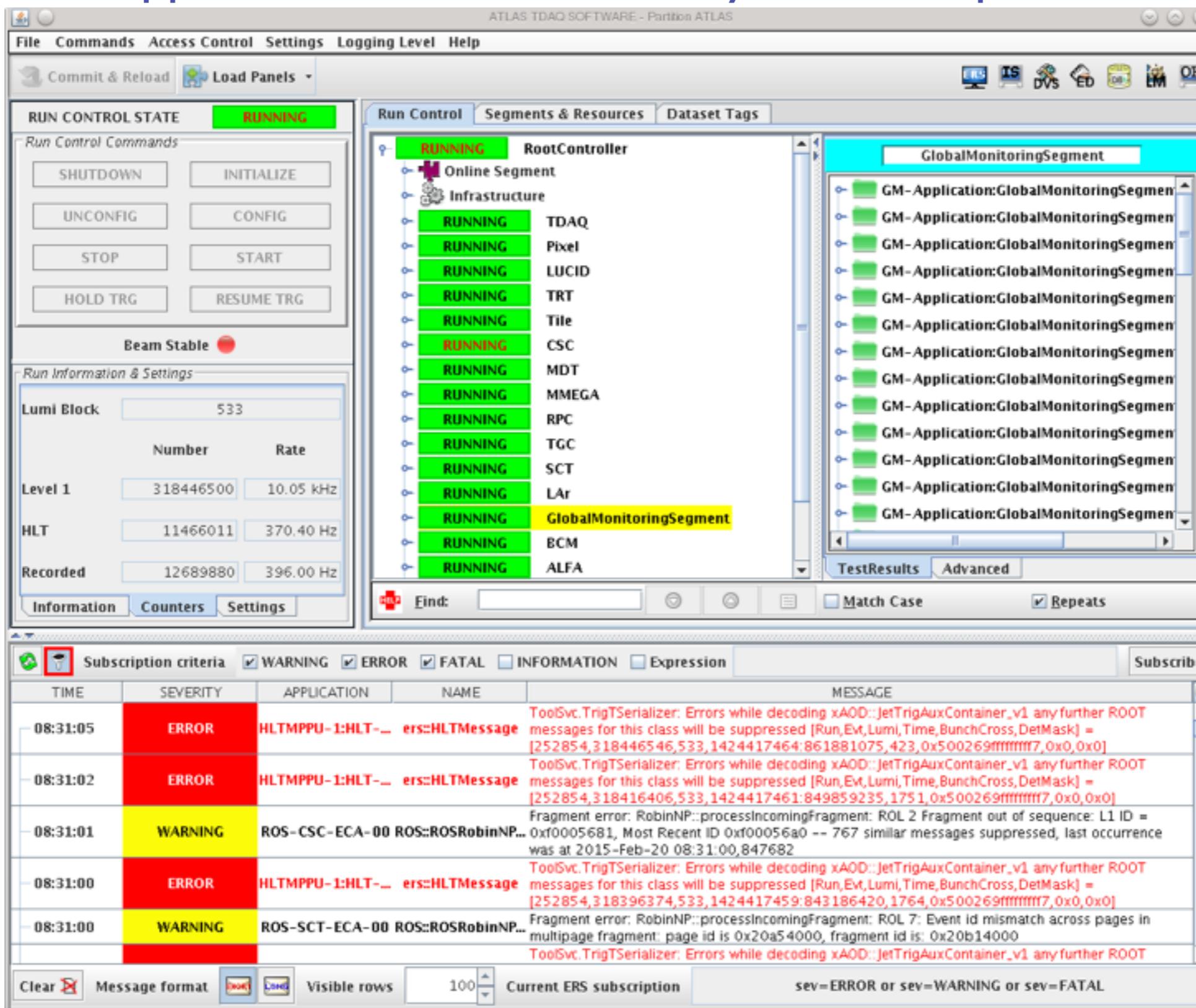
T0 monitoring



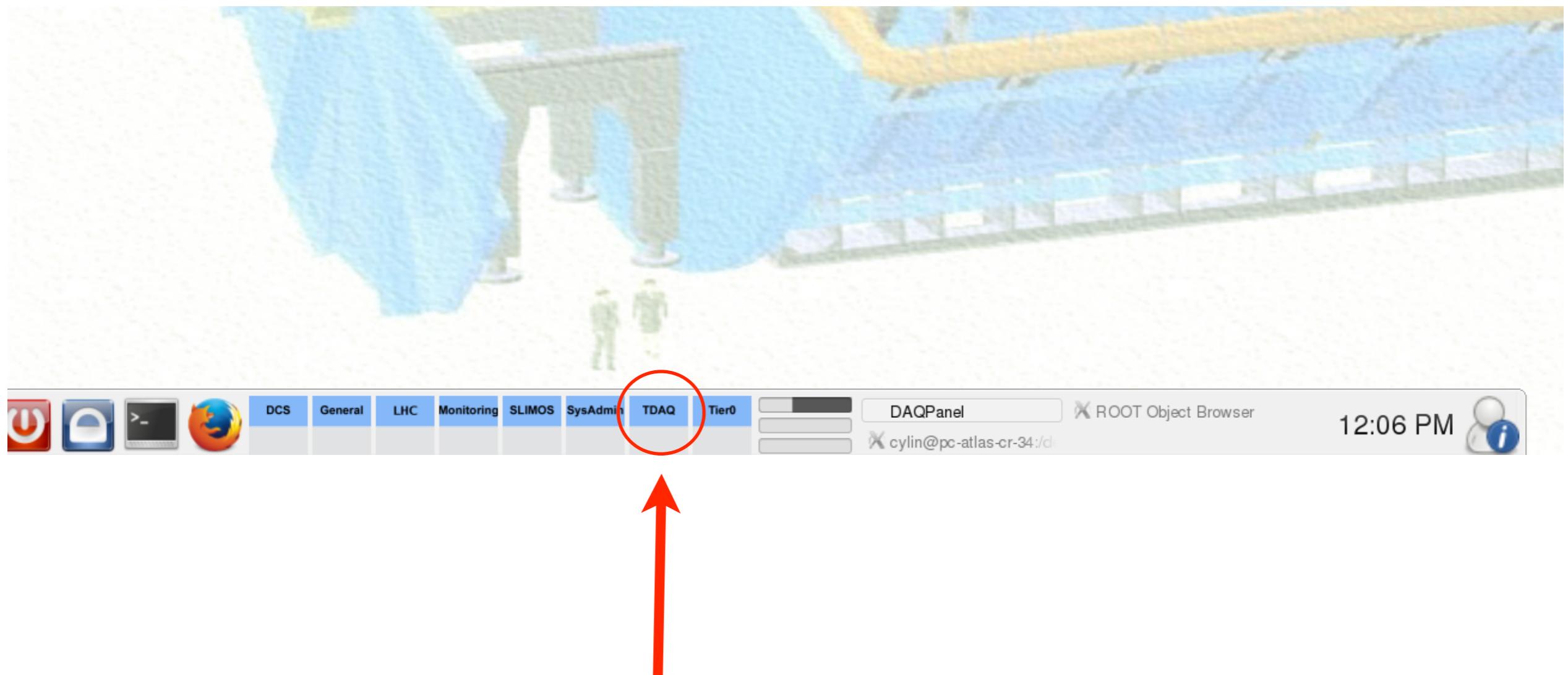
- So far using web interface
 - ▶ <https://tzcontzole01.cern.ch/prod1/monitor/>
- Quite light for the shifter but very successful
- Dedicated tool for DQ desk is being discussed



- DQ applications run automatically in ATLAS partition



- DQM applications can be opened from DAQ panel: TDAQ→DAQ panel



DAQPanel

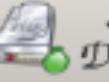
Insert Here Some Info

Setup Script: /home/alinalocal/tdaqSetup-nightly.sh
Part Name: be_test
Database File: /home/alinalocal/be_test_nightly.data.xml
Setup Opt:
OKs Opt:
ERS Filter: QUAL=TGC or QUAL=CSC or QUAL=RPC or QUAL=MDT
EvDump Opt:
OHP Opt: -c
BUSY Opt:
OMD Opt:
TRP Opt: -c

Main **Mon Advanced** **Ctrl Advanced**

 *Start Partition*  *Monitor Partition*  *RC Status*  *ERS*

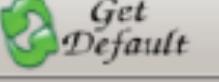
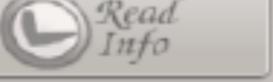
 *DBE*  *DVS*  *Log Manager*

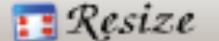
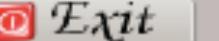
 *Busy*  *DQM Display*  *Trigger Presenter*  *SFO Display*

 *OHP*

Log Messages

```
Database File --> /home/alinalocal/be_test_nightly.data.xml
setup_daq options -->
oks_data_editor options -->
ohp options --> -c
TriP options --> -c
BUSY options -->
OMD options -->
Event Dump options -->
ERS filter --> QUAL=TGC or QUAL=CSC or QUAL=RPC or QUAL=MDT
Found partition be_test in database file
Found partition initial in database file
```

 *Get Default*  *Read Info*  *Get Partition*

 *Resize*  *Clear Log*  *Change role*  *Exit*

You are alina and your role is expert

Online Histogram Presenter

- ▶ displays several most relevant histograms from each system and CP group
- ▶ checked by shifter by eye

DAQPanel

Insert Here Some Info

Setup Script: /home/alinalocal/tdaqSetup-nightly.sh

Part Name: be_test

Database File: /home/alinalocal/be_test_nightly.data.xml

Setup Opt:

OKS Opt:

ERS Filter: QUAL=TGC or QUAL=CSC or QUAL=RPC or QUAL=MDT

EvDump Opt:

OHP Opt: -c (highlighted with a red circle)

BUSY Opt:

OMD Opt:

TRP Opt:

path to OHP configuration

Buttons: Get Default, Read Info, Get Partition

Main Tab: Start Partition, Monitor Partition, RC Status, ERS

Ctrl Advanced Tab: DBE, DVS, Log Manager

Busy Tab: Busy, DQM Display, Trigger Presenter, SFO Display

Log Messages:

```
Database File --> /home/alinalocal/be_test_nightly.data.xml
setup_daq options -->
okt_data_editor options -->
ohp options --> -c
TriP options --> -c
BUSY options -->
OMD options -->
Event Dump options -->
ERS filter --> QUAL=TGC or QUAL=CSC or QUAL=RPC or QUAL=MDT
Found partition be_test in database file
Found partition initial in database file
```

Online Histogram Presenter

- ▶ displays several most relevant histograms from each system and CP group
- ▶ used by each detector desk
- ▶ checked by shifter by eye

Buttons: Resize, Clear Log, Change role, Exit

You are alina and your role is expert

Online Histogram Presenter

System Actions View Window Help

Plugins 

Browser

DQShifter

Extra

Luminosity

Histograms

OHP Status

Status	ACTIVE
Input Rate	0
Received #	0
Routed #	0

Servers up:

Servers down:

Histogramming-CombinedInDet-1-1s

Run Status

Partition	ATLAS
Run #	UNKNOWN
Run Type	UNKNOWN
Started at	UNKNOWN
Run State	UNKNOWN

run information



1731

OHP main panel

Online Histogram Presenter

input rate

Plugins

Browser

DQShifter

Extra

Luminosity

Histograms

OHP Status

Status	ACTIVE
Input Rate	0
Received #	0
Routed #	0
Servers upx	

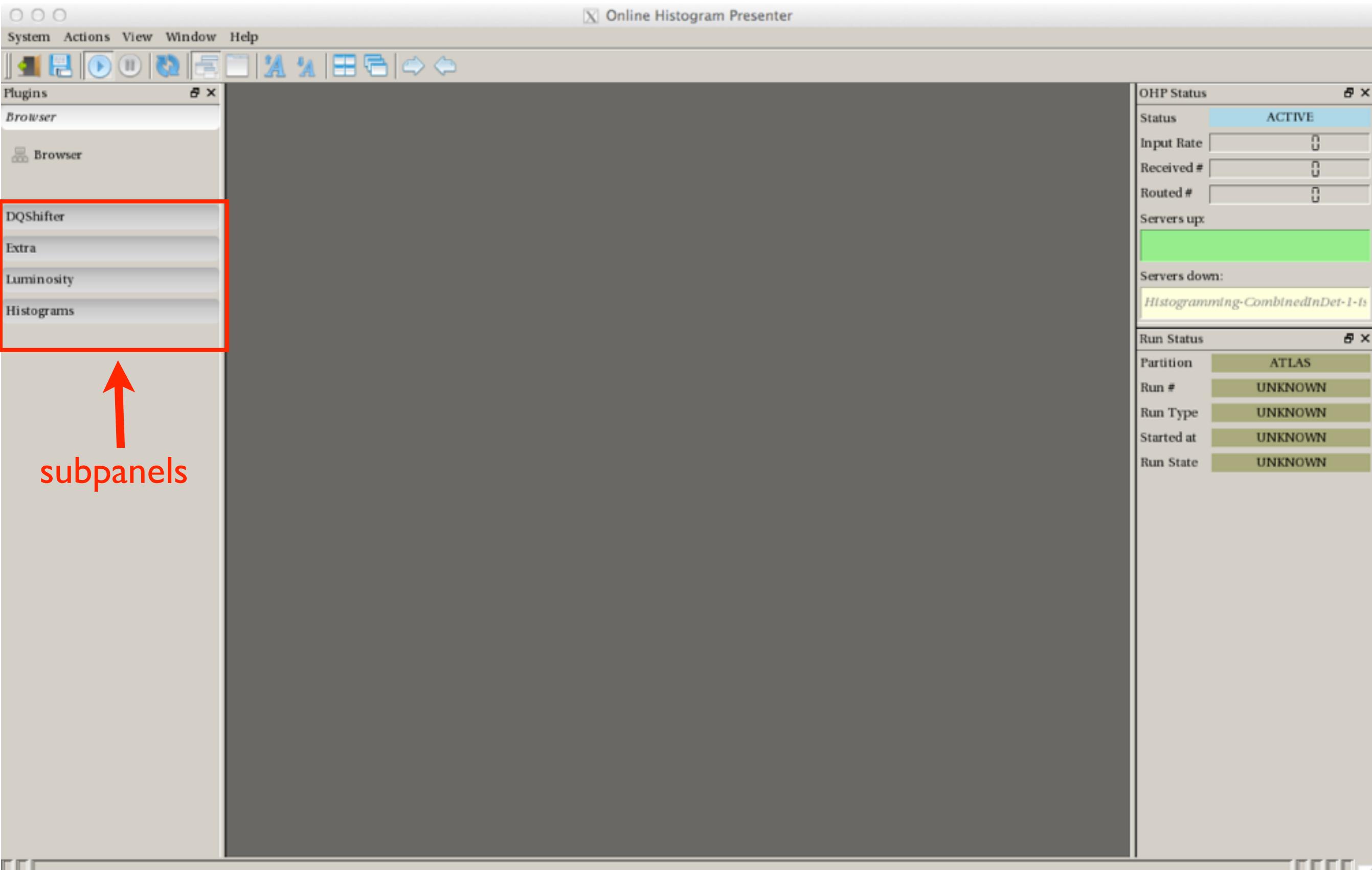
Servers down:

Histogramming-CombinedInDet-1-ls

Run Status

Partition	ATLAS
Run #	UNKNOWN
Run Type	UNKNOWN
Started at	UNKNOWN
Run State	UNKNOWN

The screenshot shows the 'OHP main panel' interface. On the left, there's a sidebar with links for 'Plugins', 'Browser', 'DQShifter', 'Extra', 'Luminosity', and 'Histograms'. The main area has tabs for 'Online Histogram Presenter' and 'input rate'. On the right, there are three status windows: 'OHP Status' (with a red box around it and a red arrow pointing to the 'Input Rate' field), 'Servers down:' (listing 'Histogramming-CombinedInDet-1-ls'), and 'Run Status' (listing 'Partition: ATLAS', 'Run #: UNKNOWN', 'Run Type: UNKNOWN', 'Started at: UNKNOWN', and 'Run State: UNKNOWN').



Online Histogram Presenter

System Actions View Window Help

Plugins Browser DQShifter

In Det Timing Calorimeter Muon ZDC Global CombPerf Physics

Extra Luminosity Histograms

histograms for systems and CP groups

OHP Status

Status	ACTIVE
Input Rate	0
Received #	0
Routed #	0

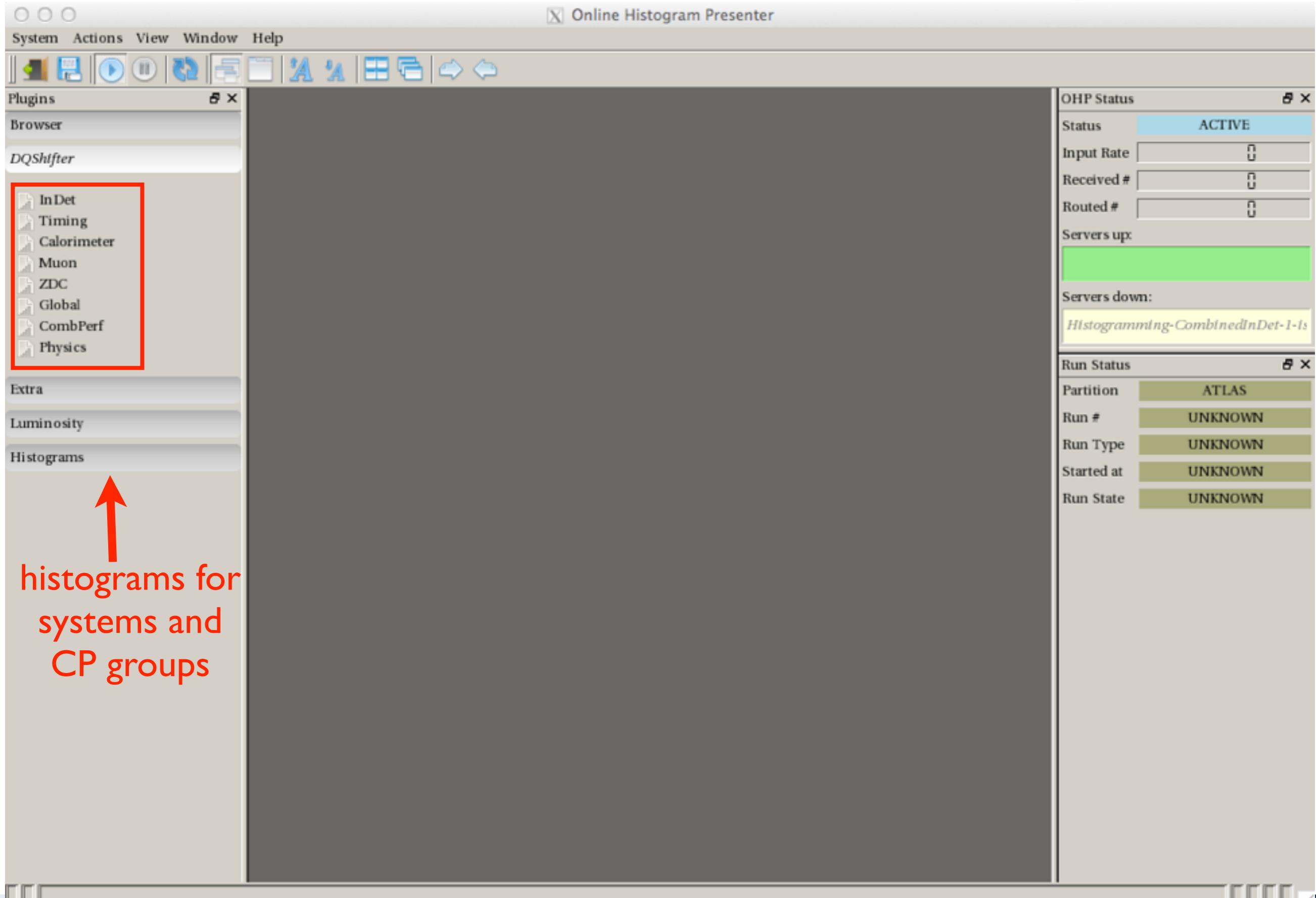
Servers up:

Servers down:

Histogramming-CombinedInDet-1-1s

Run Status

Partition	ATLAS
Run #	UNKNOWN
Run Type	UNKNOWN
Started at	UNKNOWN
Run State	UNKNOWN



Online Histogram Presenter

System Actions View Window Help

Plugins Browser DQShifter

- InDet
- Timing
- Calorimeter
- Muon
- ZDC
- Global
- CombPerf
- Physics

Extra Luminosity Histograms

InDet

TRT-Timing | TRT-Hits | TRT-Tracking

Histogramming_CombinedInDet-1-Is/ CombinedInDet_Merged/ TRT/ SHT/ EndCap/ HitRelation_C <i>is not found</i>	Histogramming_CombinedInDet-1-Is/ CombinedInDet_Merged/ TRT/ SHT/ Barrel/ HitRelation <i>is not found</i>	Histogramming_CombinedInDet-1-Is/ CombinedInDet_Merged/ TRT/ SHT/ EndCap/ HitRelation_A <i>is not found</i>
Histogramming_CombinedInDet-1-Is/ CombinedInDet_Merged/ TRT/ SHT/ EndCap/ hDriftTimeonTrk_Det_C <i>is not found</i>	Histogramming_CombinedInDet-1-Is/ CombinedInDet_Merged/ TRT/ SHT/ Barrel/ hDriftTimeonTrk_Det <i>is not found</i>	Histogramming_CombinedInDet-1-Is/ CombinedInDet_Merged/ TRT/ SHT/ EndCap/ hDriftTimeonTrk_Det_A <i>is not found</i>
Histogramming_CombinedInDet-1-Is/ CombinedInDet_Merged/ TRT/ SHT/ EndCap/ hFrontTDet_C <i>is not found</i>	Histogramming_CombinedInDet-1-Is/ CombinedInDet_Merged/ TRT/ SHT/ Barrel/ hFrontTDet <i>is not found</i>	Histogramming_CombinedInDet-1-Is/ CombinedInDet_Merged/ TRT/ SHT/ EndCap/ hFrontTDet_A <i>is not found</i>

OHP Status

Status	ACTIVE
Input Rate	0
Received #	0
Routed #	0

Servers up:

Servers down:

Histogramming-CombinedInDet-1-Is

Run Status

Partition	ATLAS
Run #	UNKNOWN
Run Type	UNKNOWN
Started at	UNKNOWN
Run State	UNKNOWN

Histogram name

If configuration is correct no empty histograms should be seen

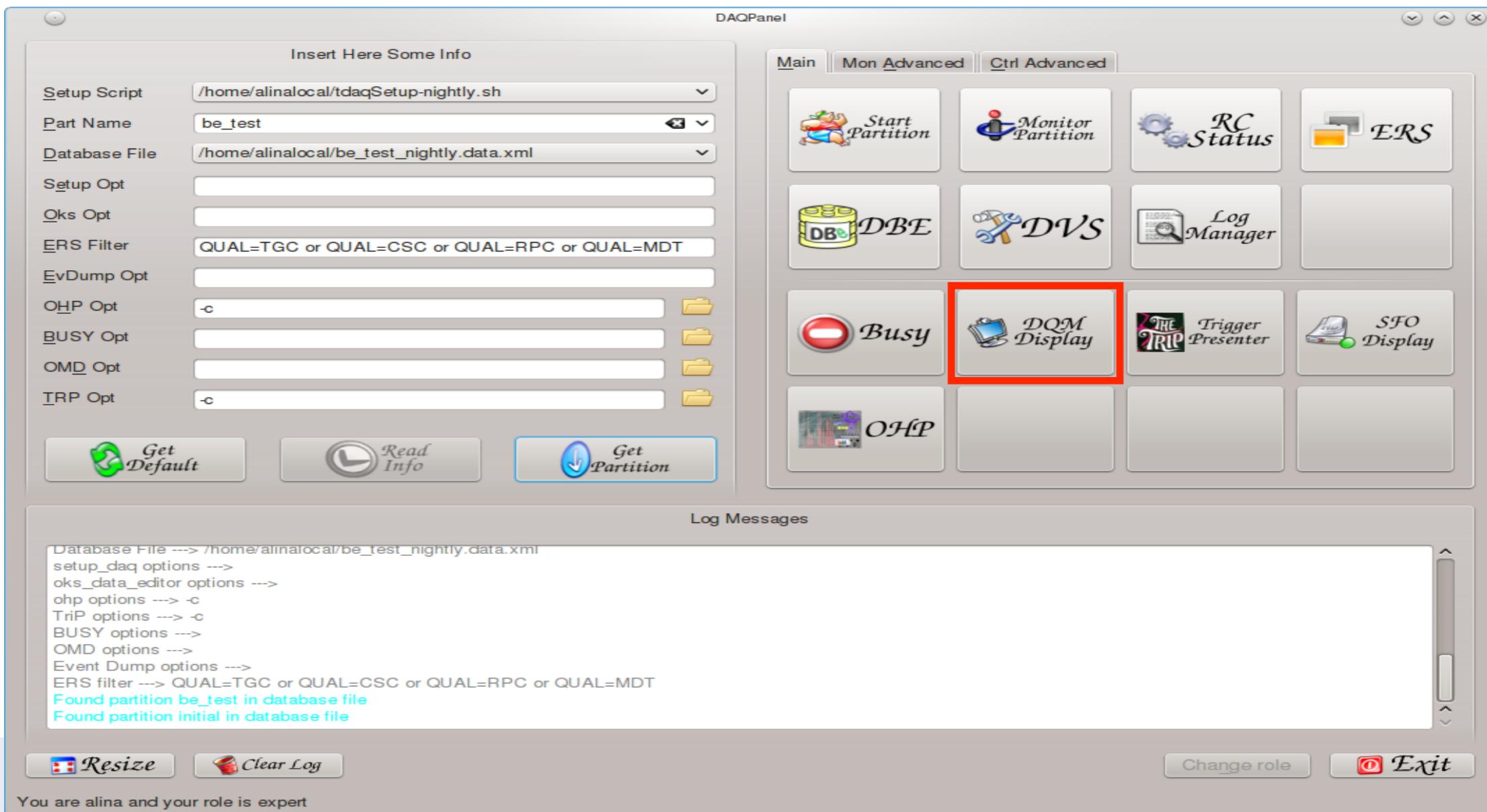
Report empty histograms in the logbook

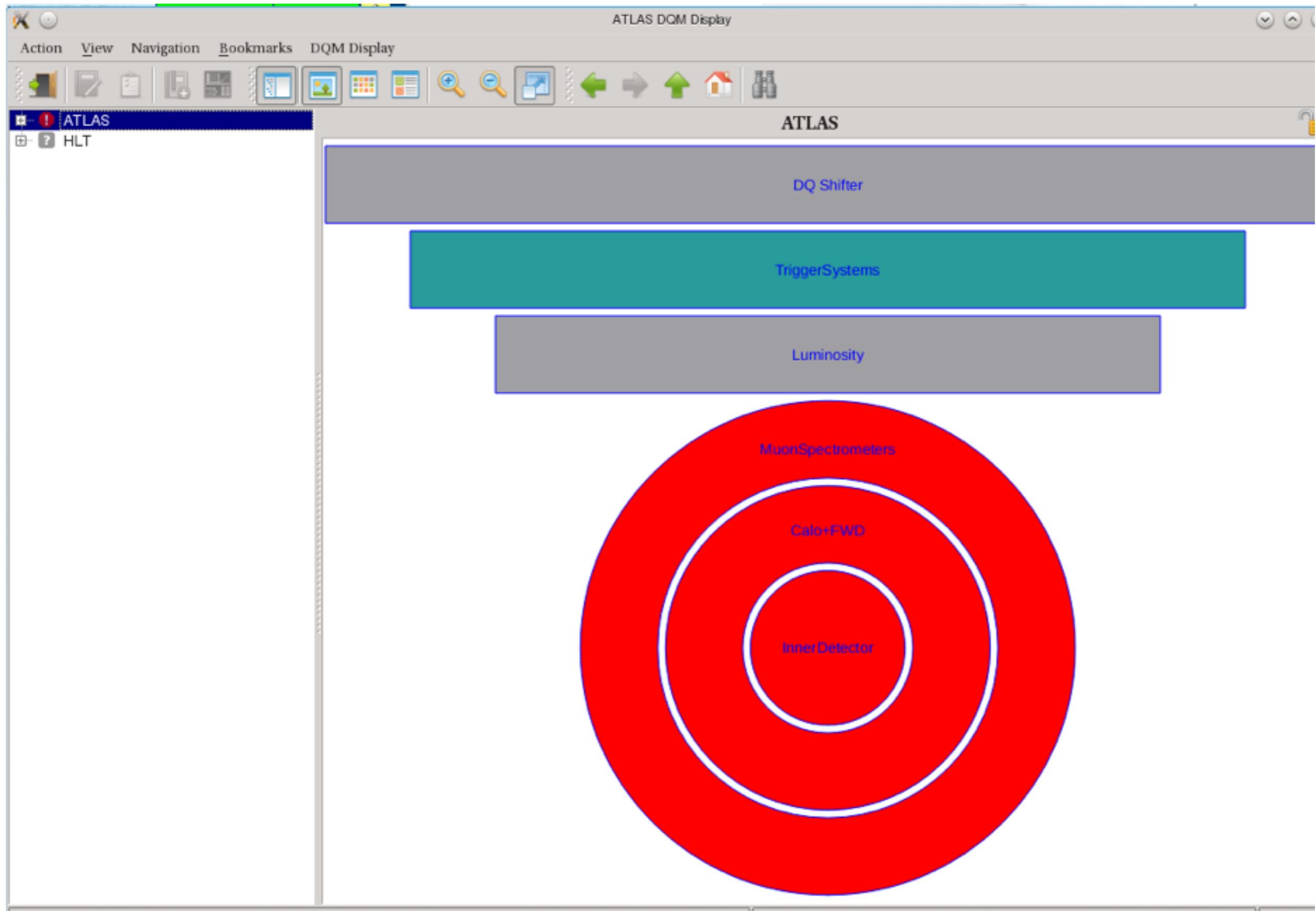


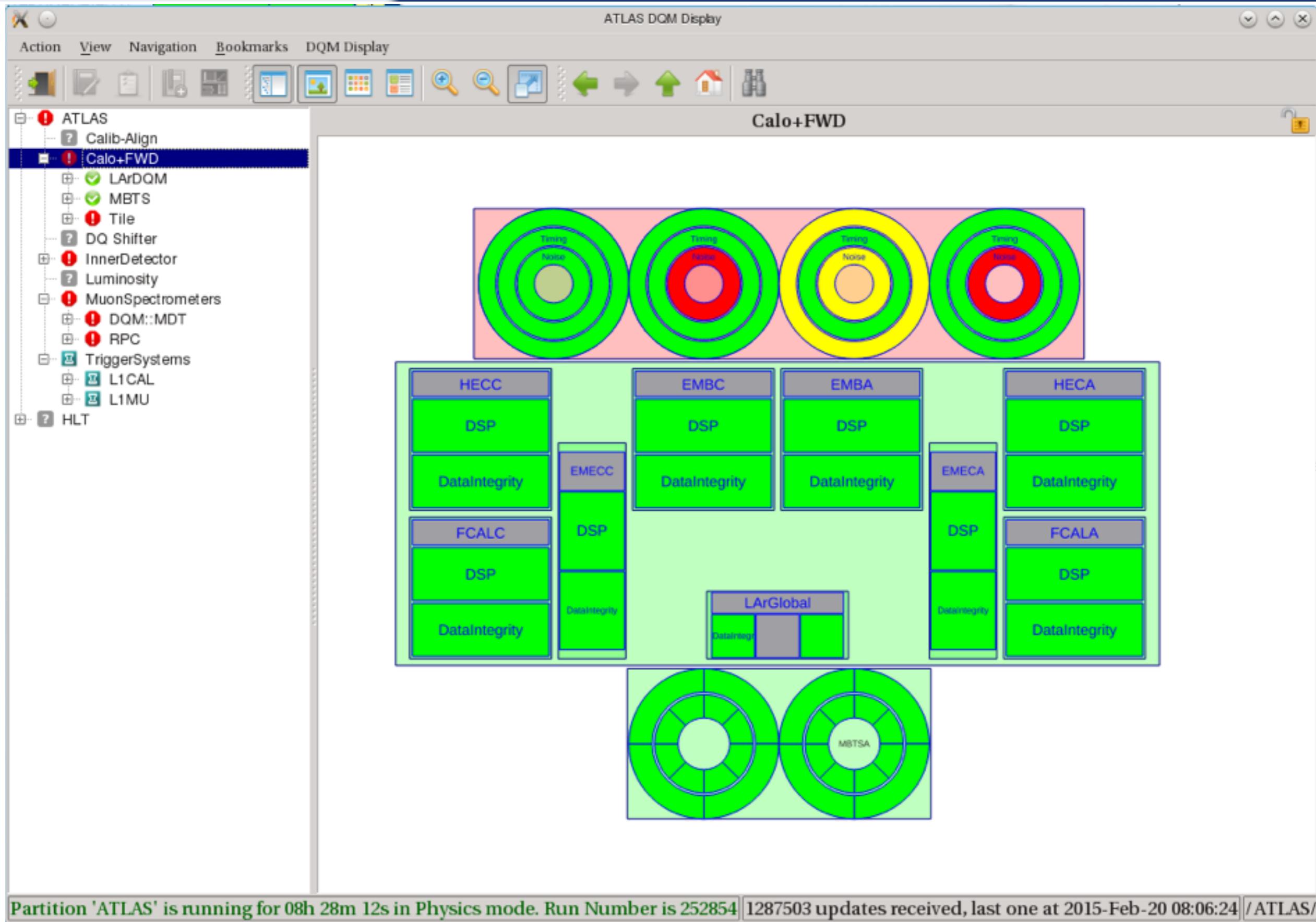
□ Data Quality Monitoring Framework

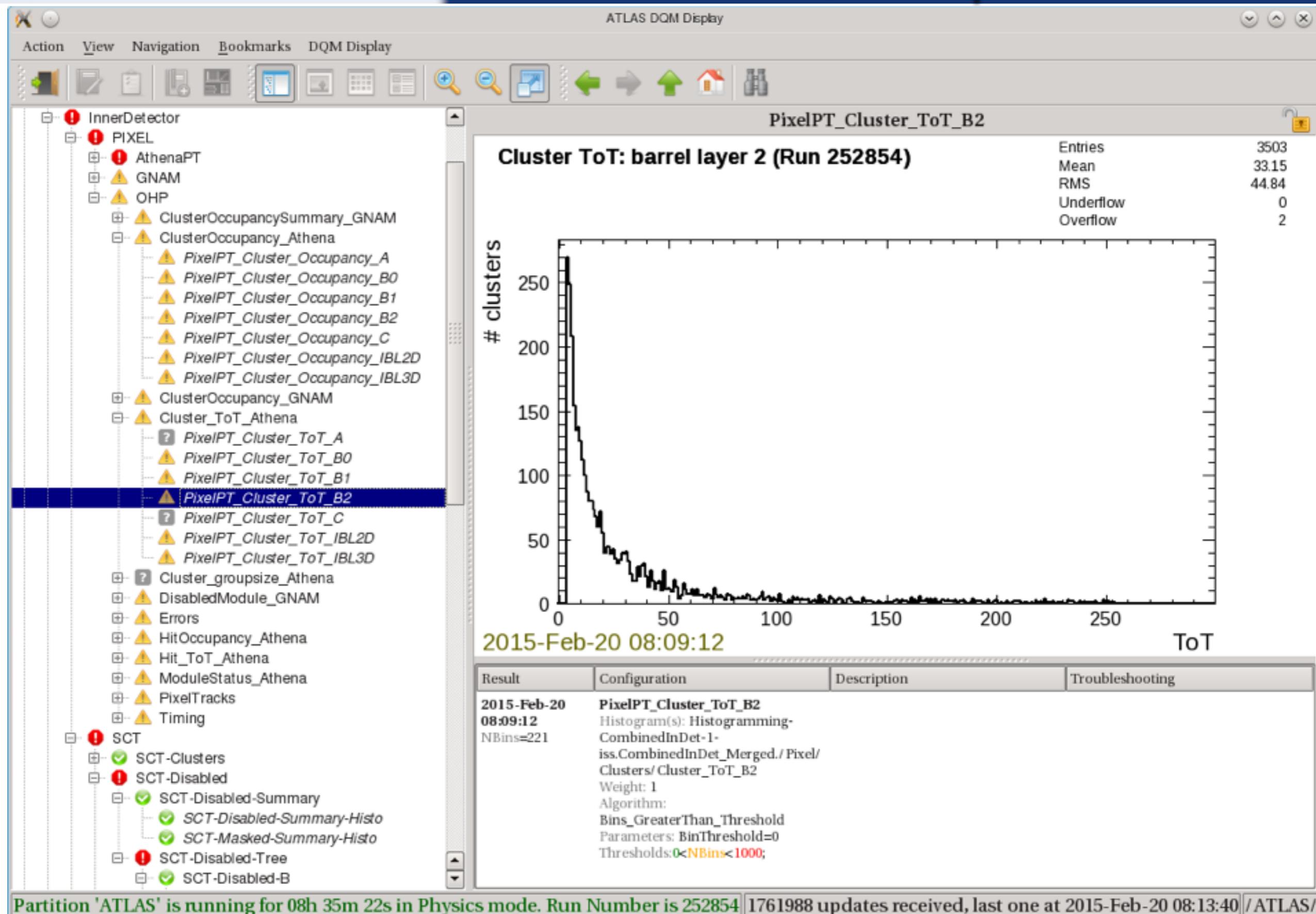
- ▶ 50'000 histograms are checked every few minutes
- ▶ automatic DQ assessment is made per histogram (DQ result)
- ▶ DQ result can be GREEN (all ok), YELLOW (flawed), RED (bad), GREY (unknown), BLUE (not enough statistics) or BLACK (detector/part not in run)

□ To give meaningful results requires careful tuning of the algorithms

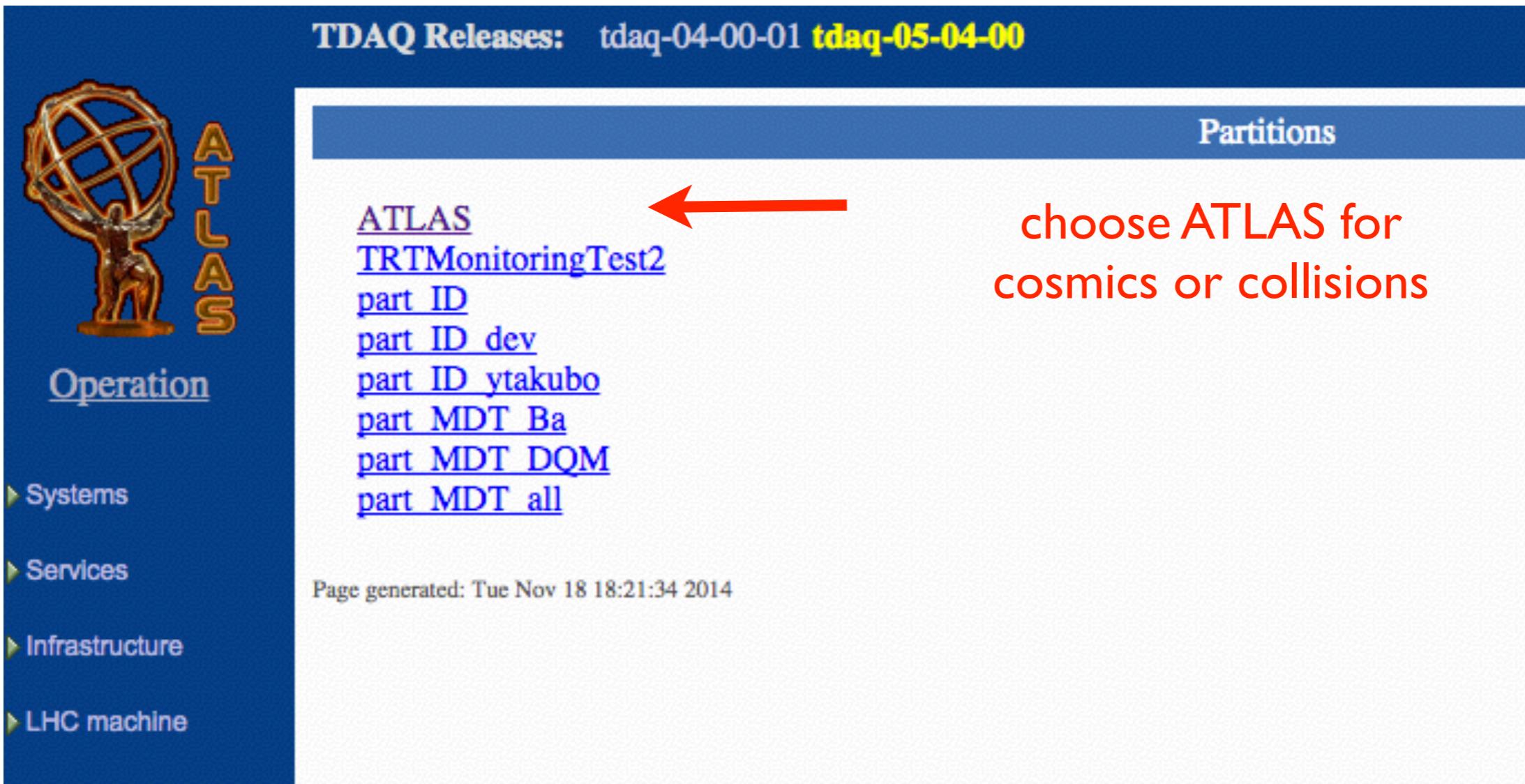








- An alternative option to display DQMF
- <https://atlasop.cern.ch/operRef.php?subs=wmi/DQM.html>



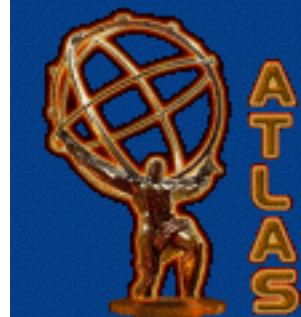
The screenshot shows a web page with a blue header bar. In the top left corner, there is a logo of Atlas holding a globe, with the word "ATLAS" written vertically next to it. The header bar contains the text "TDAQ Releases: tdaq-04-00-01 **tdaq-05-04-00**". To the right of the header bar, the word "Partitions" is visible. Below the header, there is a list of links under the heading "ATLAS". A red arrow points from the text "choose ATLAS for cosmics or collisions" to the "ATLAS" link. The list of links includes:
[ATLAS](#)
[TRTMonitoringTest2](#)
[part ID](#)
[part ID dev](#)
[part ID ytakubo](#)
[part MDT Ba](#)
[part MDT DQM](#)
[part MDT all](#)

choose ATLAS for
cosmics or collisions

Page generated: Tue Nov 18 18:21:34 2014

- ▶ Operation
- ▶ Systems
- ▶ Services
- ▶ Infrastructure
- ▶ LHC machine

TDAQ Releases: tdaq-04-00-01 **tdaq-05-04-00**



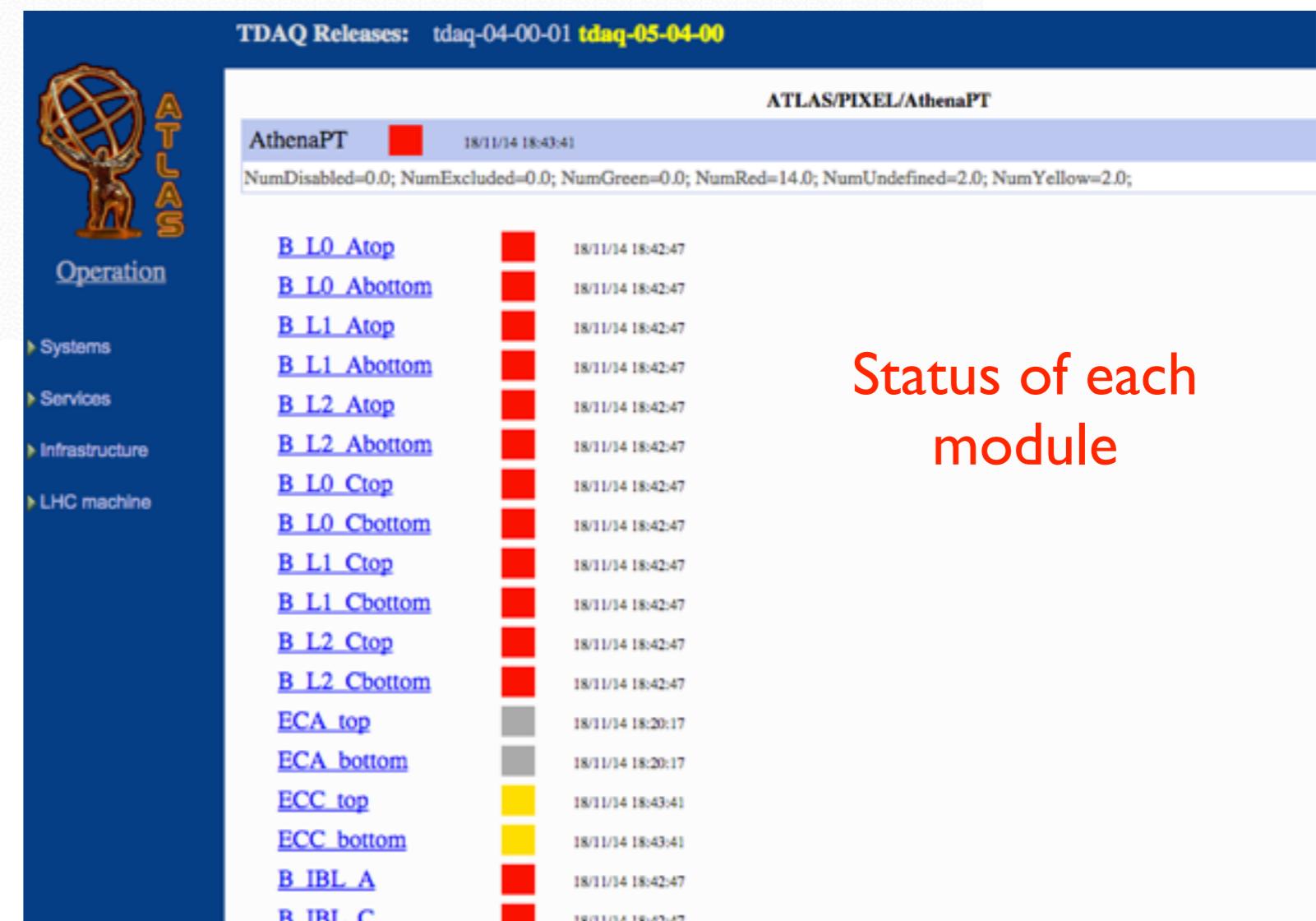
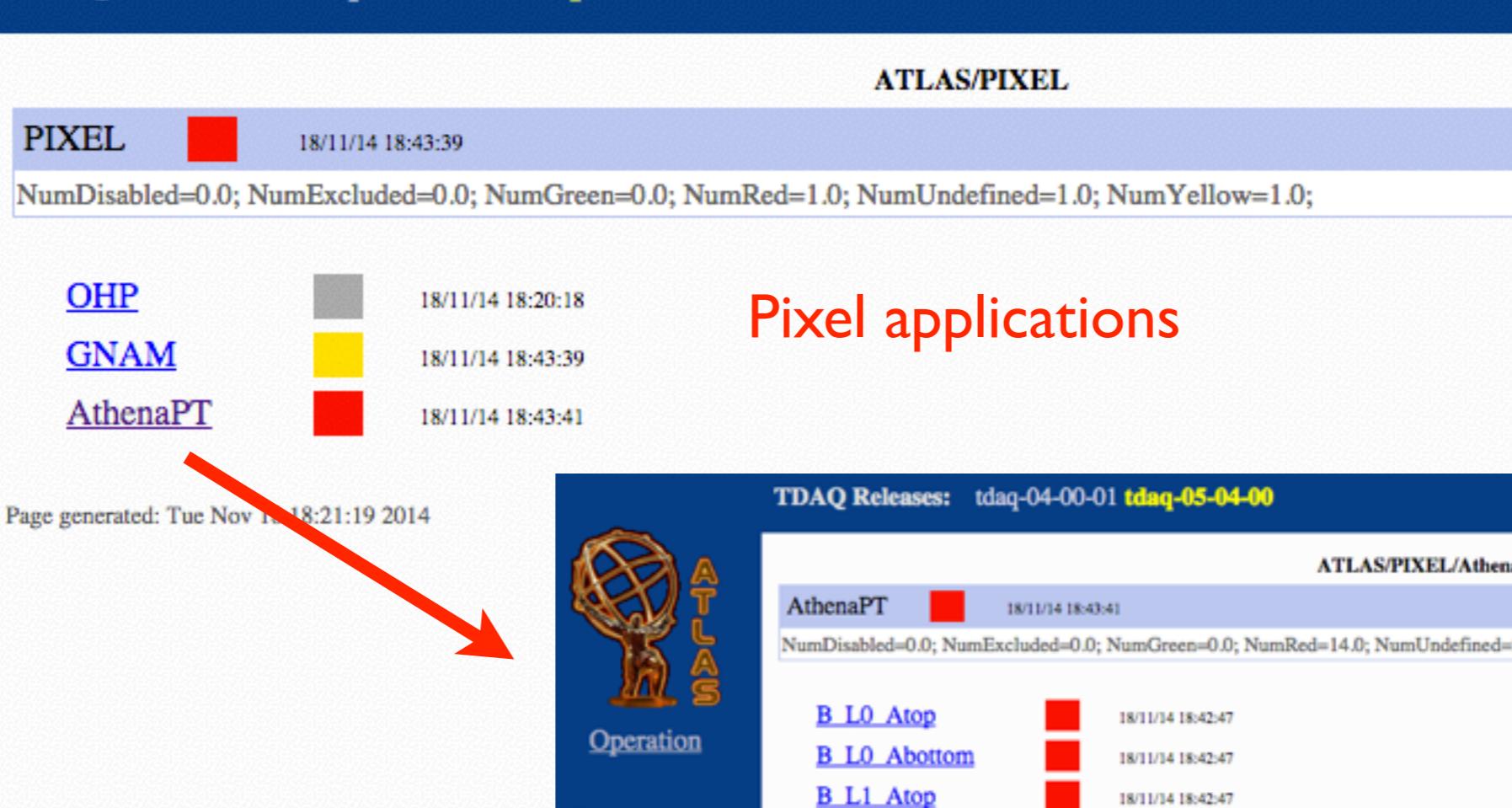
Operation

▶ Systems

▶ Services

▶ Infrastructure

▶ LHC machine



TDAQ Releases: tdaq-04-00-01 **tdaq-05-05-00**

ATLAS/ATLAS/InnerDetector/PIXEL/OHP/Cluster_ToT_Athena

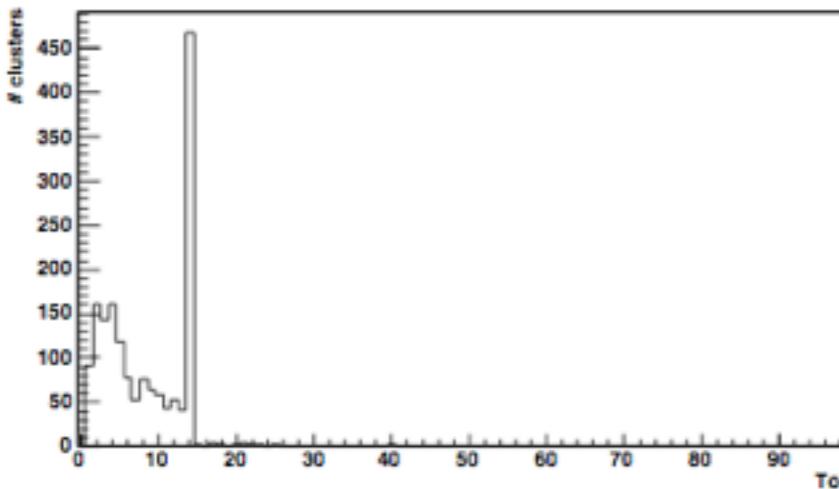
Cluster_ToT_Athena



25/2/15 01:06:22

NumDisabled=0.0; NumExcluded=0.0; NumGreen=0.0; NumRed=0.0; NumUndefined=2.0; NumYellow=5.0;

Cluster ToT for IBL Planar Modules (Run 253247)



PixelPT_Cluster_ToT_IBL2D

25/2/15 01:06:22

NBins=34.0;

Histograms [Histogramming-CombinedInDet-1-iss.CombinedInDet_Merged/Pixel/Clusters/Cluster_ToT_IBL2D](#)

Reference

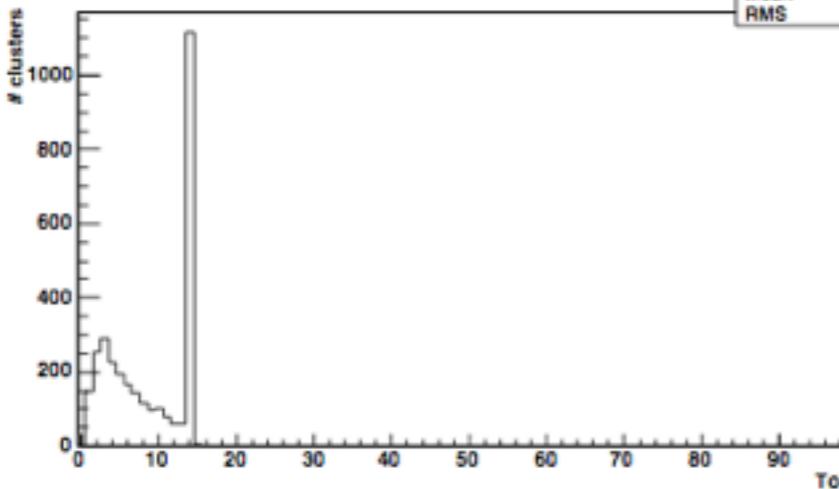
Algorithm `Bins_GreaterThan_Threshold`

Parameters `BinThreshold = 0;`

Thresholds `0 < NBins < 1000`

Cluster ToT for IBL 3D Modules (Run 253247)

Entries	3082
Mean	8.706
RMS	5.053



PixelPT_Cluster_ToT_IBL3D

25/2/15 01:06:22

NBins=25.0;

Histograms [Histogramming-CombinedInDet-1-iss.CombinedInDet_Merged/Pixel/Clusters/Cluster_ToT_IBL3D](#)

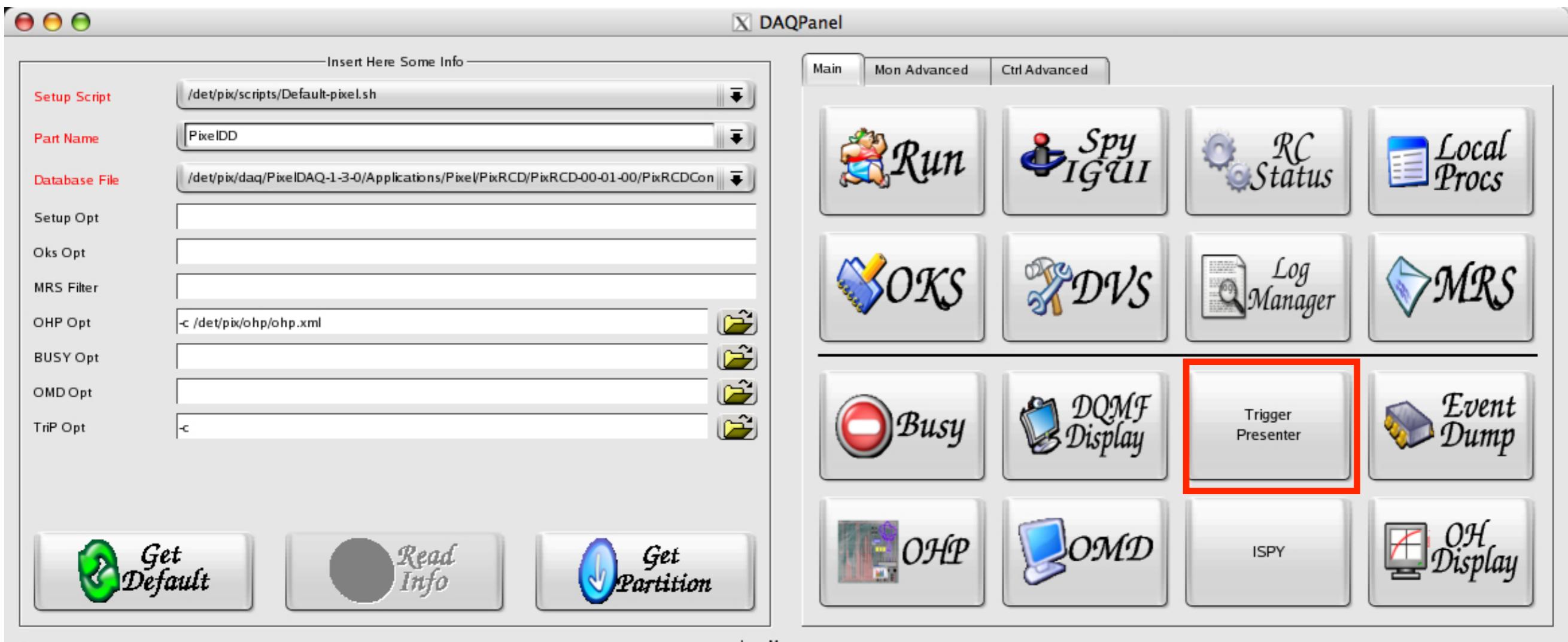
Reference

Algorithm `Bins_GreaterThan_Threshold`

Parameters `BinThreshold = 0;`

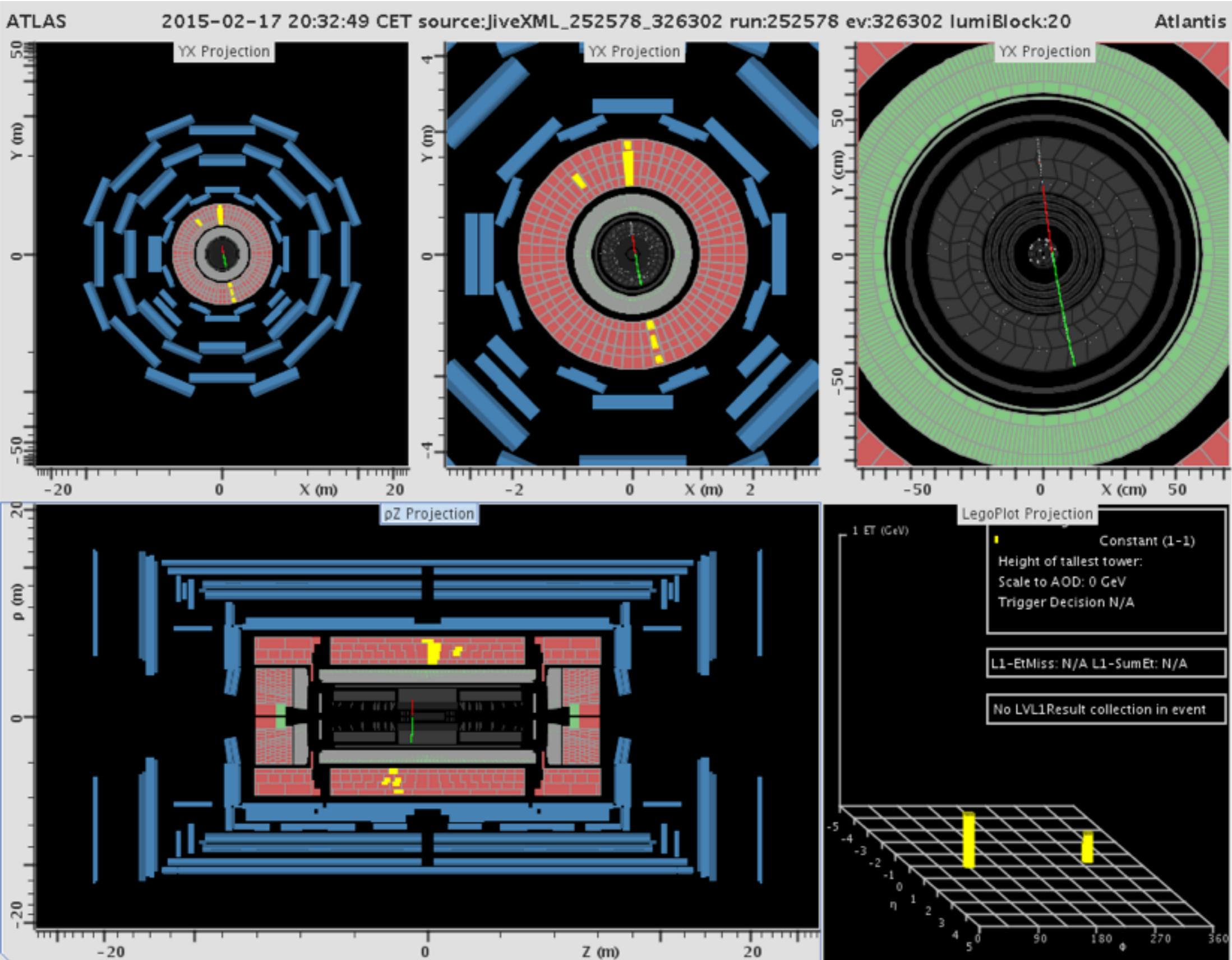
Thresholds `0 < NBins < 1000`

- Monitoring the trigger performance in the control room is vital to make sure that ATLAS is maximising the data taken and it is a first opportunity to catch any problems
 - ▶ watch LVL1, LVL2 and EF trigger rates
 - ▶ notify Shift Leader about the jumps in trigger rate



- Atlantis
 - ▶ 2D event display
- VPI
 - ▶ 3D event display
- Both allow a selection of trigger mask and event stream
- Useful tool to see hits in the detectors participating in the run

Example: event in Atlantis



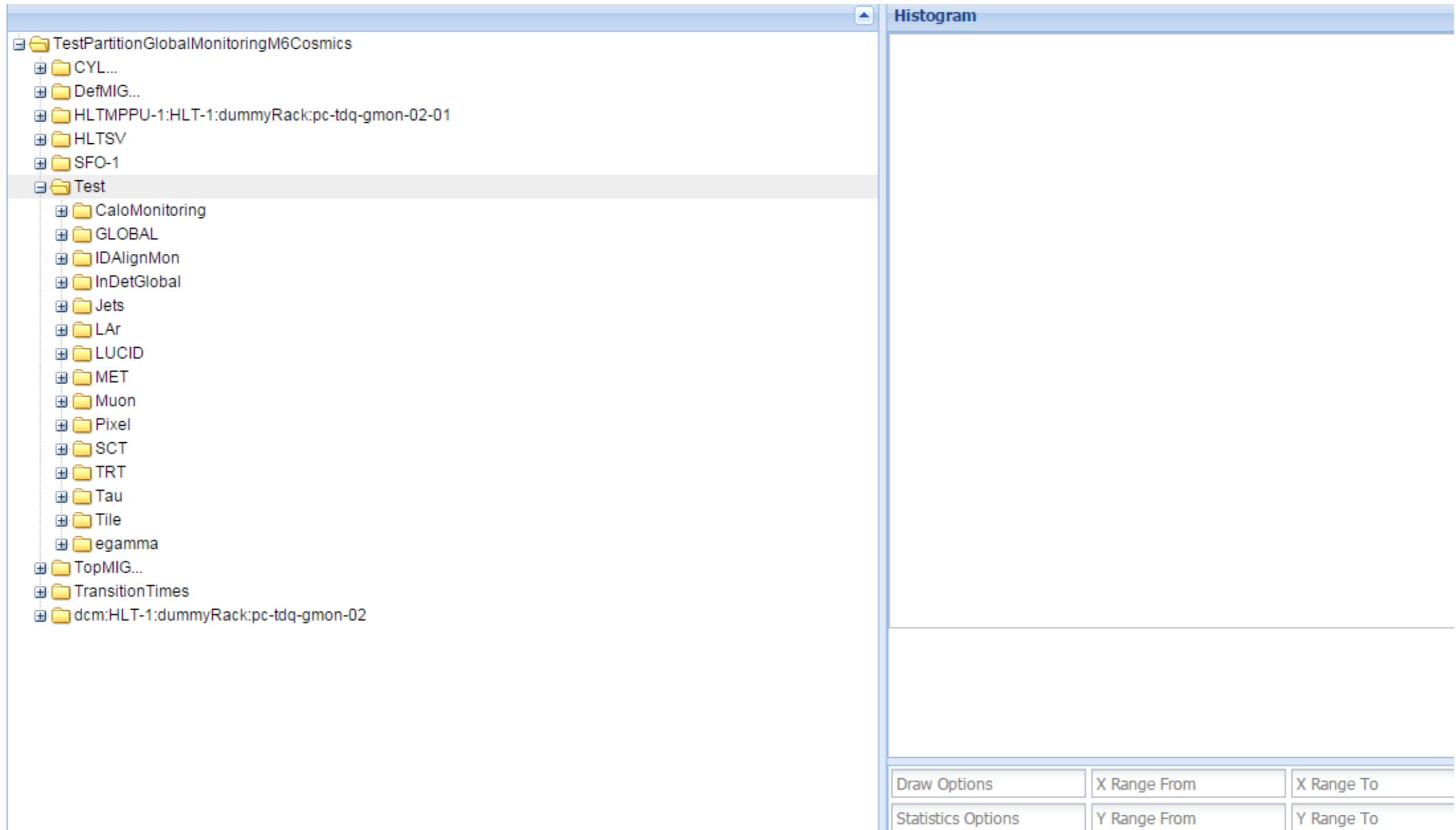
- Online Histogram display
 - ▶ expert rather than shifter tool
 - ▶ useful for trouble shooting
 - ▶ for example, if histograms don't appear in OHP

[https://atlasop.cern.ch/tdaq/
web_is/daq/runstatus.html](https://atlasop.cern.ch/tdaq/web_is/daq/runstatus.html)

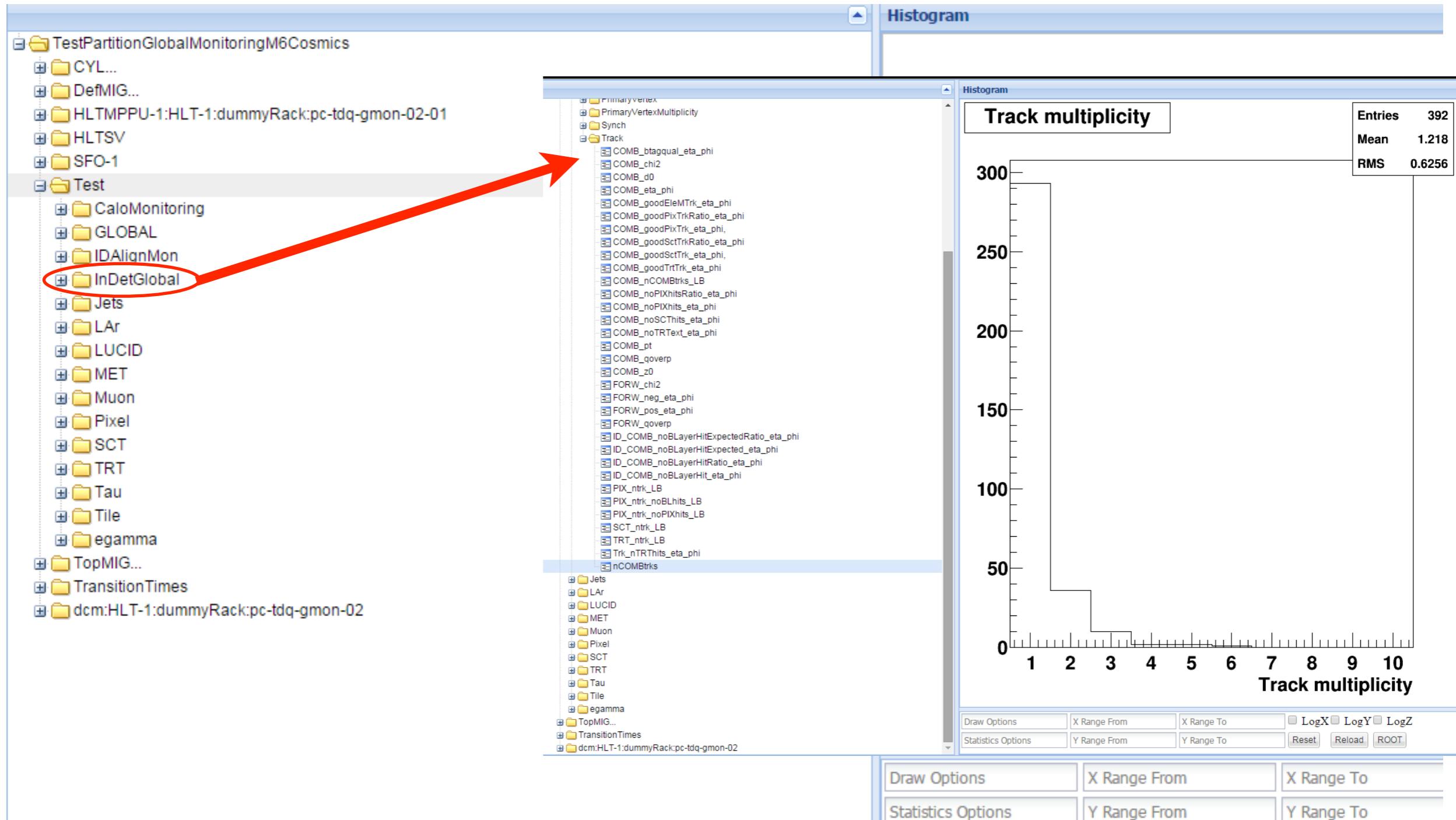
Atlas Partition Status

Partition	Services	Run Number	Run Type	State	Recording	Start	End	Time
part_ID_ytakubo	IS OH OKS PMG	246043	Physics	RUNNING	0	18/11/14 17:10:57	1/1/70 01:00:00	59892
part_TGC_FillTest	IS OH OKS PMG	246085	Emulated	NONE	0	18/11/14 20:02:44	18/11/14 20:09:17	392
initialL1CT	IS OH OKS PMG	243103	Physics	CONNECTED	0	20/10/14 13:07:46	20/10/14 15:14:45	7619
part_RPC	IS OH OKS PMG	242969	Physics	NONE	0	17/10/14 15:51:13	17/10/14 16:11:25	1212
part_MDT_all	IS OH OKS PMG	244768	Noise	???	0	6/11/14 19:23:43	6/11/14 19:24:19	35
part_TGC	IS OH OKS PMG	0	Emulated	NONE	0	1/1/70 01:00:00	1/1/70 01:00:00	???
PixelInfr	IS OH OKS PMG	246076	Physics	RUNNING	0	18/11/14 19:24:24	1/1/70 01:00:00	51882
part_ID_dev	IS OH OKS PMG	245968	Physics	RUNNING	0	18/11/14 12:04:14	1/1/70 01:00:00	78292
part_ID	IS OH OKS PMG	246093	Physics	RUNNING	0	19/11/14 09:28:23	1/1/70 01:00:00	1250
TDAQ-Tommaso	IS OH OKS PMG	245897	Physics	RUNNING	0	17/11/14 18:30:13	1/1/70 01:00:00	141536
PixelInfr_IBL	IS OH OKS PMG	246057	Physics	RUNNING	0	18/11/14 18:14:39	1/1/70 01:00:00	56072
TestPartitionGlobalMonitoringM6Cosmics	IS OH OKS PMG	245980	Physics	RUNNING	0	18/11/14 14:40:46	1/1/70 01:00:00	68902
ATLAS	IS OH OKS PMG	246060	Physics	RUNNING	1	18/11/14 18:20:14	1/1/70 01:00:00	55733
TRTMonitoringTest2	IS OH OKS PMG	245984	Physics	RUNNING	0	18/11/14 14:55:13	1/1/70 01:00:00	68032
part_MDT_Ba	IS OH OKS PMG	246095	Noise	RUNNING	0	19/11/14 09:48:51	1/1/70 01:00:00	20
TDAQROS	IS OH OKS PMG	245322	Physics	NONE	0	13/11/14 12:59:36	13/11/14 13:59:52	3616
part_MDT_DQM	IS OH OKS PMG	246002	Noise	RUNNING	0	18/11/14 15:38:22	1/1/70 01:00:00	65452
initial	IS OH OKS PMG	244954	Physics	???	0	10/11/14 12:09:32	1/1/70 01:00:00	769183

- Contains all monitoring histograms
 - ▶ appear under ATLAS partition for data taking
- Not user friendly



- Contains all monitoring histograms
 - ▶ appear under ATLAS partition for data taking
- Not user friendly



Online histograms are archived in CoCa: <https://atlasdaq.cern.ch/info/mda/coca>

CoCa Datasets

	Dataset name	<input type="button" value="Search"/>
BCM-Lumi		
CSCGnam		
DQM-Archive		
Gatherer		
HLT-BeamSpot		
Histogramming-DQM		
Histogramming-HLT		
L1CT		
L1Calo		
Lucid-Lumi		
MDA-GlobalMonitoring		
MDA-ID		
MDA-LAr-All		
MDA-LAr-Cosmic		
MDA-LAr-PT-1		
MDA-Pixel		
MDA-RPC		
MDA-SCT		
MDA-TRT		
MDA-ZDC		
MDAStressTest		
MDATest		
MDTCalibGnam		
MDTGnam		
MonAlsa		
TGCGnam		
TRP-Rates		
Tile-MDAMon		

CoCa files for dataset "Histogramming-DQM"

[\[Datasets\]](#)

File name	Size, MB	Archive, relative to /eos/atlas/atlascerngroupdisk/tdaq-mon/coca/
r0000246047_IoEoR_ATLAS_MDA-Histogramming-DQM_Histogramming-DQM.root	9	2014/Histogramming-DQM/r0000246047_IoEoR_ATLAS_MDA-Histogramming-DQM_Histogramming-DQM.root
r0000246036_I0006_ATLAS_MDA-Histogramming-DQM_Histogramming-DQM.root	9	2014/Histogramming-DQM/r0000246036_I0006_ATLAS_MDA-Histogramming-DQM_Histogramming-DQM.root
r0000246027_IoEoR_ATLAS_MDA-Histogramming-DQM_Histogramming-DQM.root	9	2014/Histogramming-DQM/r0000246027_IoEoR_ATLAS_MDA-Histogramming-DQM_Histogramming-DQM.root
r0000245998_IoEoR_ATLAS_MDA-Histogramming-DQM_Histogramming-DQM.root	9	2014/Histogramming-DQM/r0000245998_IoEoR_ATLAS_MDA-Histogramming-DQM_Histogramming-DQM.root
r0000245993_IoEoR_ATLAS_MDA-Histogramming-DQM_Histogramming-DQM.root	9	2014/Histogramming-DQM/r0000245993_IoEoR_ATLAS_MDA-Histogramming-DQM_Histogramming-DQM.root
r0000245978_IoEoR_ATLAS_MDA-Histogramming-DQM_Histogramming-DQM.root	9	2014/Histogramming-DQM/r0000245978_IoEoR_ATLAS_MDA-Histogramming-DQM_Histogramming-DQM.root

- Data Quality monitoring is essential for a successful detector operation
- It is a key ingredient for producing outstanding physics results
- DQM in ACR is critical to minimize the amount of unrecoverable data by spotting detector failures
- Many DQ tools are available
 - ▶ they should provide enough information to take decision to stop the run
 - ▶ the role of DQ desk is expected to be enhanced in Run 2 operation model

