

# **LHC BLM SYSTEM: SUMMARY OF CHANGES AND RE-COMMISSIONING AFTER EYETS**

Machine Protection Panel 07/04/2017

Christos Zamantzas on behalf of the BLM team.

# Overview

- Status of checks to be performed during:
  - Hardware Commissioning
  - Machine Checkout
  - Beam Tests
- Resolved issues
- Outstanding issues
- Summary

# STATUS OF CHECKS PERFORMED

# Hardware and Machine Checkout

- All **Hardware Commissioning** and **Machine Checkout** checks need to be completed successfully.
- Those include:
  - 8 Hardware checks
  - 3 Machine Checkout checks
- See attached xls file for some details (more info will be added) and
- MPS document [LHC-OP-MPS-0009 v.3.2](#) for explanations on reasons and conditions
  - New version to be distributed with minor changes

# Beam Tests

	Rep.	Action
1	S	<b>Validate Interlock Request functionality of the BLM crates.</b>
	FW-CS	Decrease thresholds to very low value (trim application).
	FW-TC	Inject low intensity pilots in regular intervals in Beam 1 and/or Beam 2.
		At each interval close sequentially collimator jaws around the ring in order to force different BLM crates to trigger interlock requests.
		Aim to have the majority of crates at least once. <i>Time estimate: 2h</i>
2	S	<b>Validate Interlock Request functionality of the BLETC modules.</b>
	FW-TC	Decrease thresholds to very low value (trim application).
	FW-CS	Inject a low intensity pilot in Beam 1 and/or Beam 2.
	FW-CF	Create a local bump until an interlock request is sent by the system.
		Aim to have up to the 1.3 s Running Sum measurement over its Threshold value. <i>Time estimate: 1h</i>
3	S	<b>Measure the interlock request system latency.</b>
	FW-TC	Decrease thresholds to very low value (trim application).
	FW-CS	Close one TCP collimator jaw in Point 3 and a second in Point 7 in order to block completely the passage of beam.
	FW-CF	Inject a low intensity pilot in Beam 1 and Beam 2.
		Calculate the system latency to initiate an interlock request by making the difference between the timestamps recorded by the BIS and the Injection Kicker. (for added accuracy the propagation delays can be removed for the beam to reach from the injection region to the detector the requested the interlock) <i>Time estimate: 2h</i>
4	S	<b>Test interface of direct BLMs with the beam dumping system (same test as 7.3.4 of [1]).</b>
		Reduce the voltage setting of the abort threshold.
		Dump the injected beam on the collimator TCDQ and TCSG (with local bump). The threshold must have been lowered sufficiently, to provoke a beam dump request.
		Record the beam dump.
		This test must be repeated for each beam and for both TCDQ and TCSG.
		From the amount of lost beam and the BLM reading, deduce the nominal threshold setting.
		Are there variations with respect to the impact conditions? Measure delay between the time where the loss signal exceeds the threshold and the time of the beam dump (time stamps in logging DB). <i>Time estimate: 2h (without the two accesses: could be scheduled during injection tests)</i>
5	S, O	<b>Verify Injection Interlock Inhibit functionality</b>
		Tests with pilot beam during commissioning of injection protection system.
		Create losses above dump threshold and modify blindout time
		Record interlock input from blindable/non-blindable crates
		If losses above dump threshold cannot be reached, lower the monitor factor of blindable crates BLMs
		Tests with trains (288 b or what is being used for scrubbing) Tighten TCDIs from 5 sig to 4.5 sig (likely settings for Hilumi) Tighten monitor factor <i>Time estimate: 1h (first time might be more)</i>

# Injection Interlock Inhibit

- Tests with pilot beam
  - During commissioning of injection protection system
  - Create losses above dump threshold
  - Modify blindout time
  - Record interlock input from blindable/non-blindable crates
  - If losses above dump threshold cannot be reached, lower the monitor factor of blindable crates BLMs
- Tests with trains
  - 288 b or what is being used for scrubbing
  - Tighten TCDIs from 5 sig to 4.5 sig (likely settings for Hilumi)
  - Tighten monitor factor

Criteria for successful test:

- **Functionality:** detectors in blindable crates DO NOT interlock within given blindout time and losses above threshold
- **Redundancy:** detectors in non-blindable crates DO interlock in case losses go above threshold on those, while blindable ones do not interlock
- **Inhibit time:** get feeling for which blindout time is needed – not critical, can be adjusted later

Issues resolved to date

# RESOLVED ISSUES

# Tunnel Installation

ECR [LHC-BLM-EC-0008](#) v.0.1 summarises the changes in the tunnel installation and the name changes during EYETS

In summary:

- Removal of IP1 D1 detectors
- New or renames of detectors for TCPCV.A6R7.B2, TCPCH.A5R7.B2 and TCSPM.D4R7.B2
- New detectors for ATLAS/AFP
- Rename of detectors next to ALICE BCMs

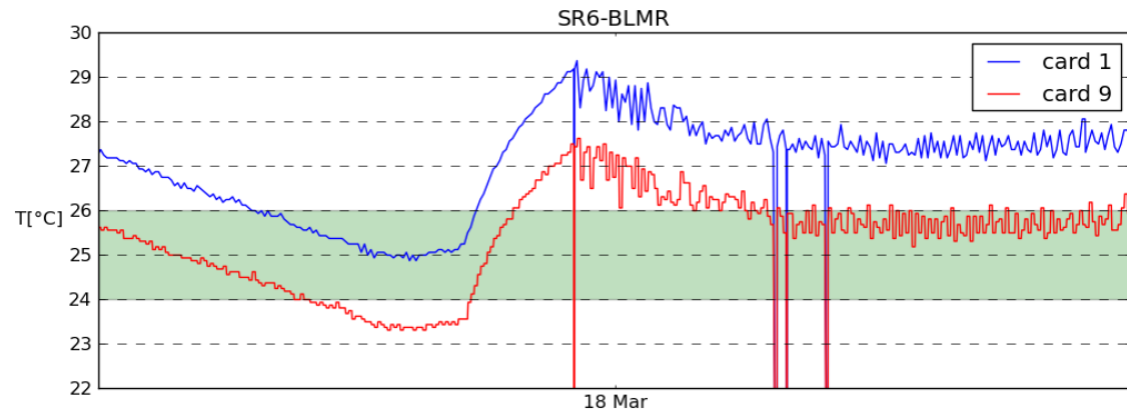




# Rack Waterflow Valves

[BIBML-1205](#) & [BIBML-1298](#):

Replaced damaged waterflow valves of the thermalized rack in SR6 and SR7



# HV Power Supplies

## [BIBML-1257](#): HV PSU Issues

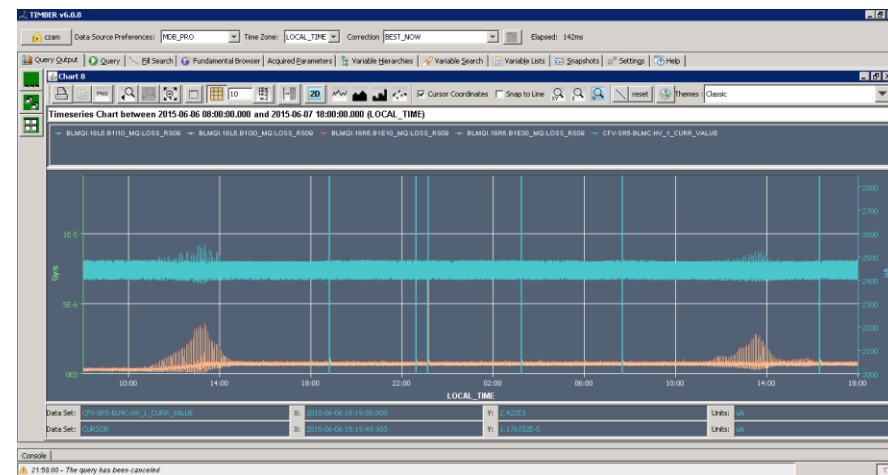
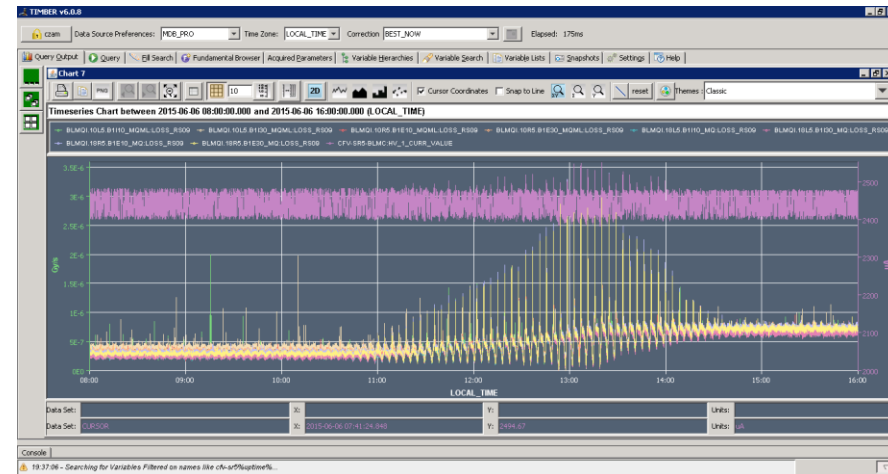
Investigated deeper the issues seen with the high voltage power supplies of the detectors such as:

[BIBML-1256](#) [BIBML-1036](#) [BIBML-1037](#)

which have costed several hours of downtime.

- Replacement of some components
- Redesign of the output stage

New design given to the manufacturer and replaced all PSUs.



# BOBR (BST Timing)

[BIBML-1310](#): Several BOBR modules with old firmware found

- Added a test to check firmware version
- Several crates found running old firmware (7/27)

Firmware was upgraded to latest release

Some hardware discrepancies have been detected in **cfv-sr8-blmr** captured by feedback event on 03-APR-2017 14:59:26:

MODULETYPE	SLOT	SUBSLOT	FIRMWARE_VERS	ID	DRIVER_VERS	STATUS	ERROR_MSG
BDI_BOBR	12		0x33			DISCREPANCY	Firmware version discrepancy!! Value expected: 0X35

For more details, you can consult the report in CC Data Browser with the latest feedback clicking on the following link:  
[https://apex-sso.cern.ch/pls/htmldb\\_dbabco/f?p=CONFIG\\_BROWSER:FEC\\_CONFIG\\_FEEDBACK::::P180\\_DSC:cfv-sr8-blmr](https://apex-sso.cern.ch/pls/htmldb_dbabco/f?p=CONFIG_BROWSER:FEC_CONFIG_FEEDBACK::::P180_DSC:cfv-sr8-blmr)

You can find more information about these HW Discrepancy Feedback notifications and why you have received this e-mail in the following page: <https://wikis.cern.ch/display/config/CCS+Domains#CCSDomains-DriverConfigFeedback>

This email has been sent automatically.

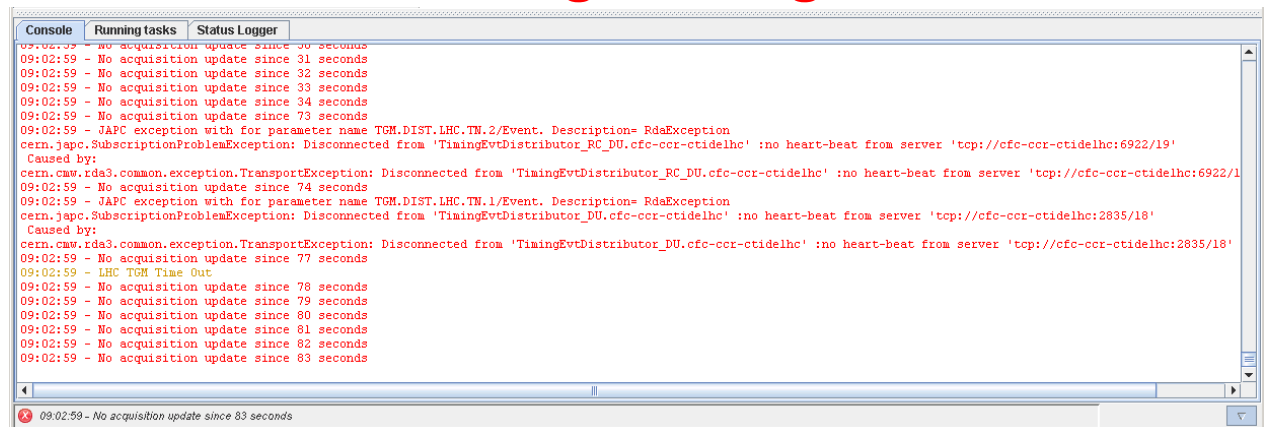
For any further questions please contact the [Controls Configuration Support](#), Visit CCS portal at: [cdb.cern.ch](http://cdb.cern.ch) or our [Wikis](#).

# RBAC & Concentrators

- RBAC roles have been revised
  - All not necessary or old roles cleaned
  - Will need to test during dry-runs
- Concentrators have been redelivered
  - Were blocked due to library changes

Thanks to CO for the support

- Some disconnections and timing missing is seen:



```
Console | Running tasks | Status Logger
09:02:59 - No acquisition update since 30 seconds
09:02:59 - No acquisition update since 31 seconds
09:02:59 - No acquisition update since 32 seconds
09:02:59 - No acquisition update since 33 seconds
09:02:59 - No acquisition update since 34 seconds
09:02:59 - No acquisition update since 73 seconds
09:02:59 - JAPC exception with for parameter name TGM.DIST.LHC.TN.2/Event. Description= RdsException
cern.japc.SubscriptionProblemException: Disconnected from 'TimingEvtDistributor_RC_DU.cfc-ccr-ctidelhc' :no heart-beat from server 'tcp://cfc-ccr-ctidelhc:6922/19'
Caused by:
cern.cmw.rds3.common.exception.TransportException: Disconnected from 'TimingEvtDistributor_RC_DU.cfc-ccr-ctidelhc' :no heart-beat from server 'tcp://cfc-ccr-ctidelhc:6922/19'
09:02:59 - No acquisition update since 74 seconds
09:02:59 - JAPC exception with for parameter name TGM.DIST.LHC.TN.1/Event. Description= RdsException
cern.japc.SubscriptionProblemException: Disconnected from 'TimingEvtDistributor_DU.cfc-ccr-ctidelhc' :no heart-beat from server 'tcp://cfc-ccr-ctidelhc:2835/18'
Caused by:
cern.cmw.rds3.common.exception.TransportException: Disconnected from 'TimingEvtDistributor_DU.cfc-ccr-ctidelhc' :no heart-beat from server 'tcp://cfc-ccr-ctidelhc:2835/18'
09:02:59 - No acquisition update since 77 seconds
09:02:59 - LHC TGM Time Out
09:02:59 - No acquisition update since 78 seconds
09:02:59 - No acquisition update since 79 seconds
09:02:59 - No acquisition update since 80 seconds
09:02:59 - No acquisition update since 81 seconds
09:02:59 - No acquisition update since 82 seconds
09:02:59 - No acquisition update since 83 seconds
09:02:59 - No acquisition update since 83 seconds
```

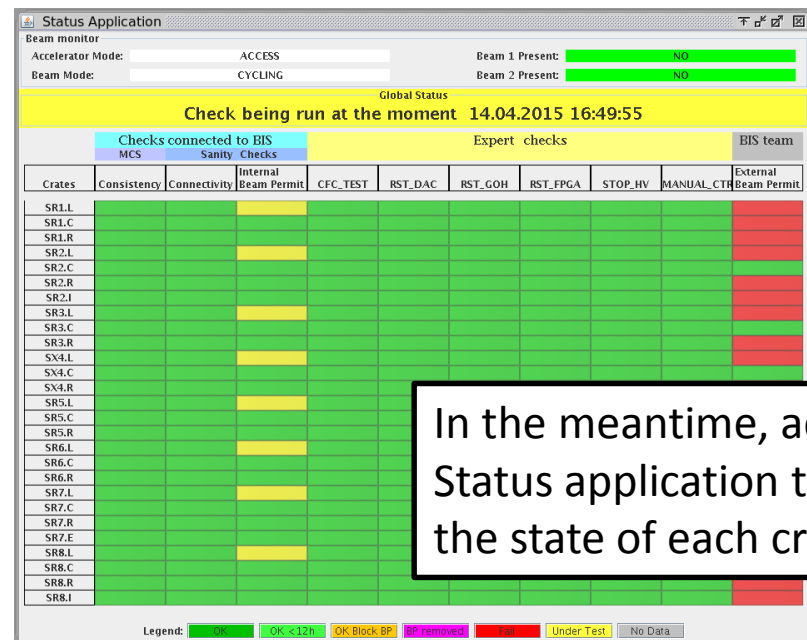
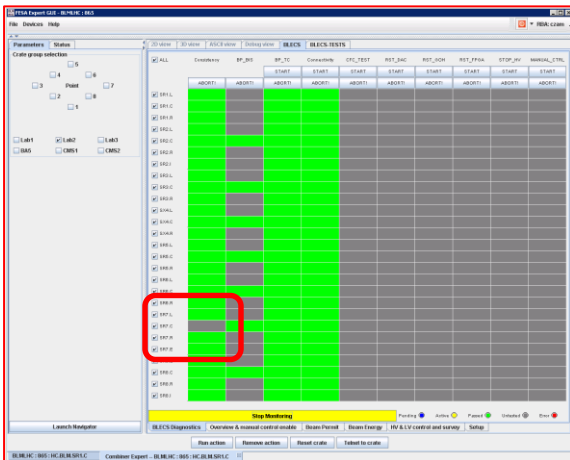
# OUTSTANDING ISSUES

# Sanity Checks

BIBML-937: Sanity Checks' result in the Sequencer does not always gets registered in the BLECS

- Several calls from the CCC that checks cannot complete
- MCS Check had passed (thus the Sequencer showed as green, but the BLECS did not get the result as TRUE to release the permit). During the retries, MCS was being skipped.

Not yet sure what is the cause.

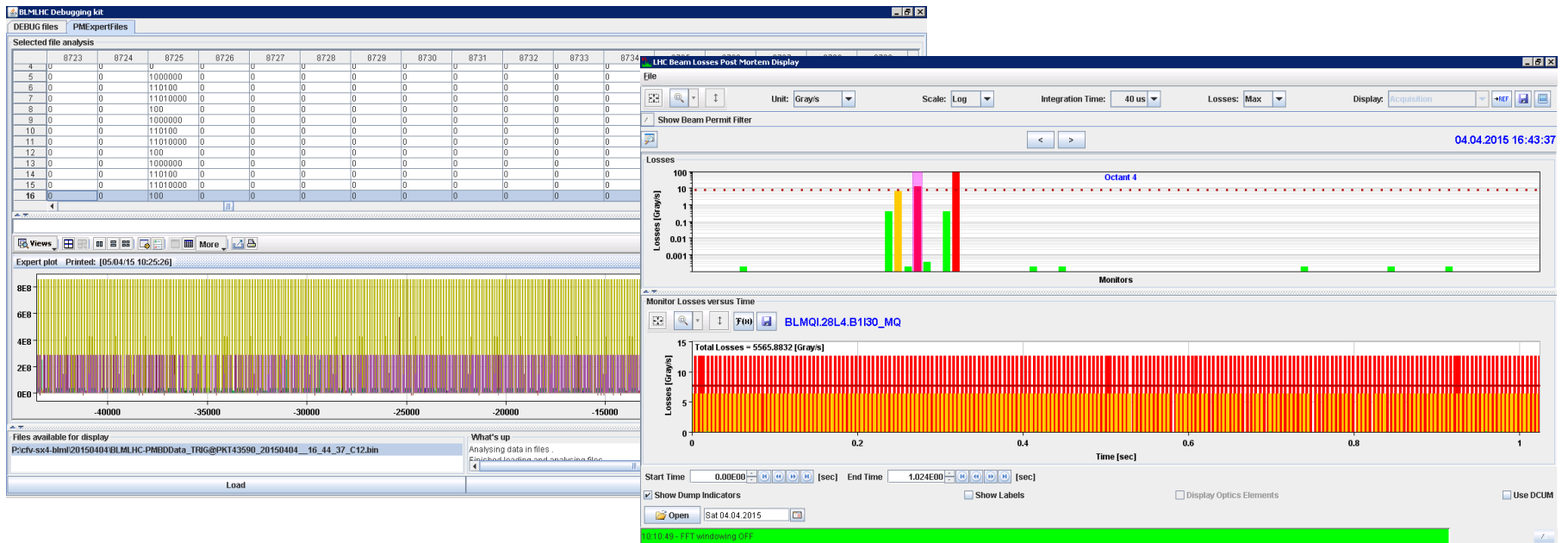


# Post-Mortem Data 1/2

[BIBML-881](#): In few cases the GPM Buffer is not working correctly

- The issue is on the SRAM recording of the data.
- The spikes seen are the markers between channels.

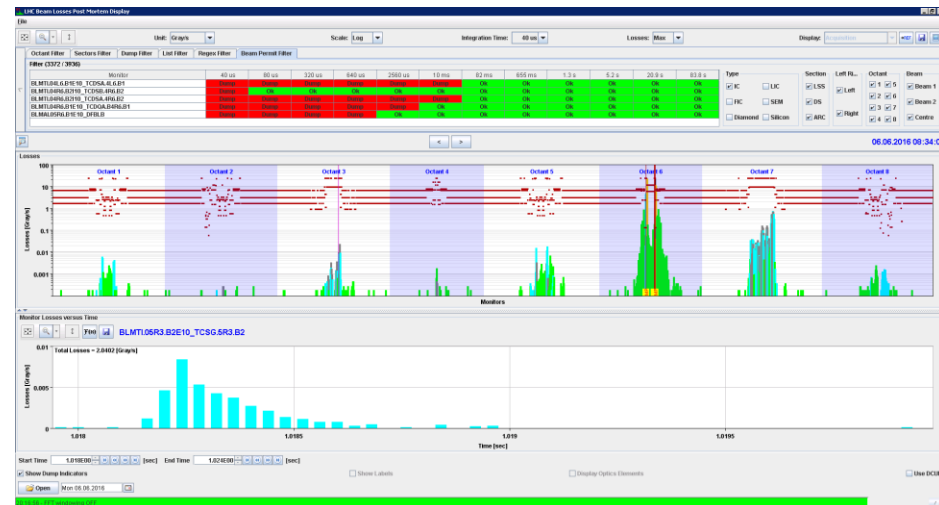
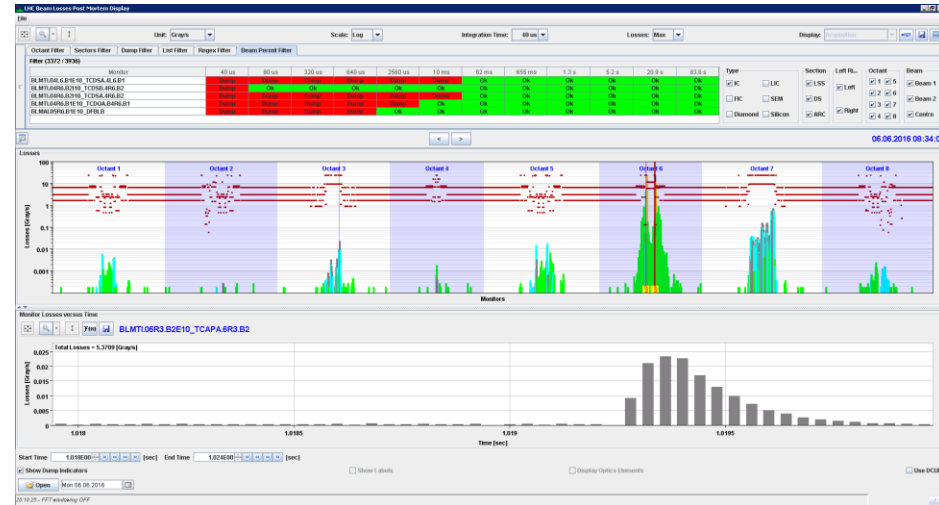
Card has been exchanged (Note: had 5 similar cases in Run 1)



# Post-Mortem Data 2/2

[BIBML-1249](#): PM data sometimes not in sync between crates

- In few of the PM data recorded it is visible 1 ms misalignment
- A common factor on those observed events is that the BeamDumped1 & 2 events had a ms difference
- One possible explanation is that the PM data for the misaligned crates have been readout from a different buffer than the rest





# Summary

## Commissioning:

- Hardware and Machine checkout checks ongoing
- Tests with beam to be planned
  - New test for the 'blindable' channels

## System Issues:

- No machine protection critical issues
- Some work still needed to bring the system into operational mode