

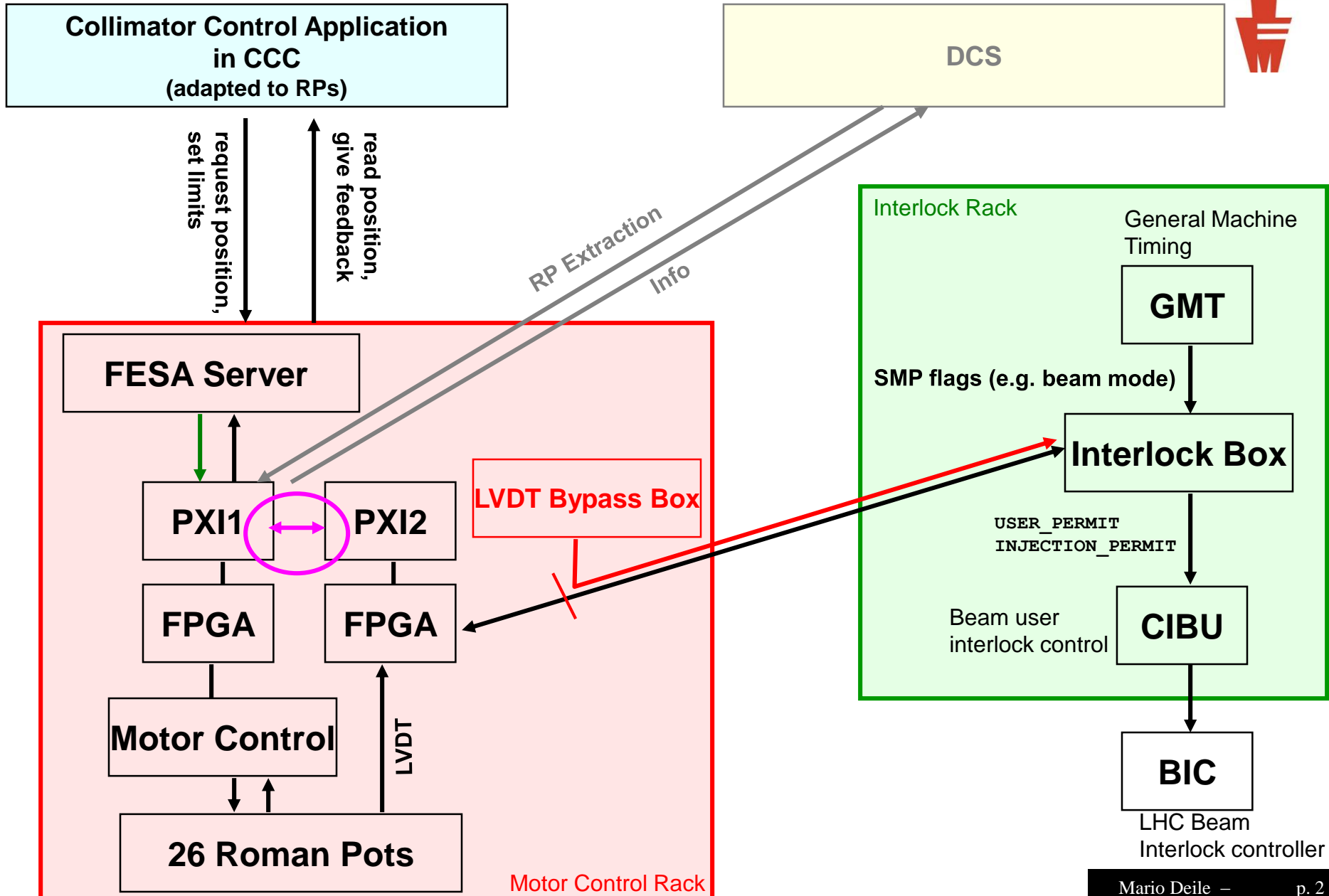
# TOTEM Interlock Revalidation



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# Movement System Architecture (strongly simplified)





Based on previous validation note <https://edms.cern.ch/document/1501228> :

- Beam-mode dependent tests not redone  
(They concern the logic in the hardware “interlock box”; not touched)
- **Retested:**
  - Correct transmission of all position limits to the interlock PXI and read-back to the CCC collimator application
  - Correct system reaction to violations of the limits  
(RP retraction for violation of warning limits,  
RP retraction + dump for violation of dump limits)

Done for all 26 RPs and for all inner limits:

- old inner warning
- old inner dump
- new inner dump

Outer limits: no operational meaning → tested transmission for all pots,  
retraction and dump for a subset of pots

- Test of the automated operational sequence (reset, set limits, drive pots)

# Illustration



All documentation in collimation logbook:

<https://www.cern.ch/ab-dep-op-elogbook/elogbook/secure/eLogbook.php?shiftId=1065515>

<https://www.cern.ch/ab-dep-op-elogbook/elogbook/secure/eLogbook.php?shiftId=1065549>

<https://www.cern.ch/ab-dep-op-elogbook/elogbook/secure/eLogbook.php?shiftId=1065583>

The screenshot shows the Roman Pot Control Application interface. The main window is titled "Roman Pot Control Application (Device: XRPH.C6R5.B1/56-210-N-H)". The interface is divided into several sections:

- Top Left:** "Set Roman pot positions" section with a text input for "HOR (LU) [um]" set to "35 000" and buttons for "Apply!", "Cancel last", "Stop all", and "Go Home".
- Bottom Left:** "Positions readout from the low-level" section with a table showing LVDT, Motor, and Resolver values for "Hor".
- Bottom Left (continued):** "Display jaw:" section with checkboxes for "Hor (dashed)" and "TBA".
- Bottom Left (continued):** "Positions:" section with checkboxes for "Set", "LVDT", "Warn", "Lim", "Res", "ot", and "IPL".
- Bottom Left (continued):** "BLM:" section with checkboxes for "BLM 1", "BLM 2", "BLM 3", "BLM 4", and "Log1".
- Bottom Left (continued):** "Int. Time:" section with checkboxes for "1.31s", "81.92ms", "12 Hz", and "Threshold".
- Bottom Left (continued):** "Console" section showing a log of events: "20:49:38 - Start set-up for update of motor positions to LVDT readings" and "20:49:40 - Done!".
- Top Right:** "Views" section with a "More" button.
- Center:** "Beam loss data [15/06/15 20:51:27]" plot showing "Beam loss signal [a.u.]" vs "time [hh:mm:ss]". The plot shows a noisy signal fluctuating between approximately 1.5E-7 and 2.0E-7.
- Bottom Center:** "Jaw positions [15/06/15 20:51:26]" plot showing "Jaw positions [um]" vs "time [hh:mm:ss]". The plot shows a blue line for "LVDT" and a yellow dashed line for "IPL='new inner limit'". The LVDT position starts at approximately 40000 um and decreases to about 35000 um.

The screenshot shows the "CIB.USC55.R5.B1 frame" log window. The window is titled "CIB.USC55.R5.B1 frame" and has an "Associate" button. The log is displayed in a table with columns: Permit, Timestamp, Visibility, Event Type, and Description. The log entries are as follows:

Permit	Timestamp	Visibility	Event Type	Description
ALL	15-06-15 20:51:18.055191	ALL	USER_PERMIT	2 A F-T
ALL	15-06-15 20:51:18.055190	ALL	USER_PERMIT	2 B F-T
ALL	15-06-15 20:51:17.905362	ALL	USER_PERMIT	2 B T-F
ALL	15-06-15 20:51:17.905360	ALL	USER_PERMIT	2 A T-F
EXPERT	15-06-15 16:28:56.000000	EXPERT	TIME	NEW UTC LOADED
EXPERT	15-06-15 16:28:56.000000	EXPERT	TIME	PLL LOCKED
EXPERT	15-06-15 16:28:55.782071	EXPERT	TIME	PPS CONNECTED
EXPERT	15-06-15 16:27:24.000000	EXPERT	TIME	PPS MISSED
EXPERT	15-06-15 16:27:24.000000	EXPERT	TIME	PLL ERROR
EXPERT	15-06-15 16:27:24.000000	EXPERT	TIME	PPS ERROR
EXPERT	15-06-15 16:27:23.237294	EXPERT	TIME	PPS MULTIPLE
ALL	15-06-15 15:42:02.782050	ALL	MARKER	LHC_POST_MORTEM
EXPERT	15-06-15 15:42:02.782000	EXPERT	TIME	EVENT RECEIVED
ALL	15-06-15 15:42:02.782000	ALL	MARKER	OTHERS
EXPERT	15-06-15 14:37:08.005715	EXPERT	TIME	NEW UTC LOADED
EXPERT	15-06-15 14:37:01.000000	EXPERT	TIME	PLL LOCKED
EXPERT	15-06-15 14:37:00.015218	EXPERT	TIME	PPS CONNECTED
ALL	15-06-15 14:36:10.284684	ALL	MARKER	LHC_POST_MORTEM
EXPERT	15-06-15 14:36:10.284634	EXPERT	TIME	EVENT RECEIVED
ALL	15-06-15 14:36:10.284634	ALL	MARKER	OTHERS
EXPERT	15-06-15 14:35:28.000000	EXPERT	TIME	PPS MISSED
EXPERT	15-06-15 14:35:28.000000	EXPERT	TIME	PLL ERROR
EXPERT	15-06-15 14:35:28.000000	EXPERT	TIME	PPS ERROR
EXPERT	15-06-15 14:35:27.984077	EXPERT	TIME	PPS MULTIPLE
EXPERT	15-06-15 14:23:52.005599	EXPERT	TIME	NEW UTC LOADED
EXPERT	15-06-15 14:23:45.000000	EXPERT	TIME	PLL LOCKED
EXPERT	15-06-15 14:23:44.338326	EXPERT	TIME	PPS CONNECTED
EXPERT	15-06-15 14:19:27.000000	EXPERT	TIME	PPS MISSED
EXPERT	15-06-15 14:19:27.000000	EXPERT	TIME	PLL ERROR
EXPERT	15-06-15 14:19:27.000000	EXPERT	TIME	PPS ERROR
EXPERT	15-06-15 14:19:26.659654	EXPERT	TIME	PPS MULTIPLE
ALL	15-06-15 12:42:12.671855	ALL	USER_PERMIT	2 B F-T
ALL	15-06-15 12:42:12.671855	ALL	USER_PERMIT	2 A F-T
ALL	15-06-15 12:42:12.442027	ALL	USER_PERMIT	2 B T-F
ALL	15-06-15 12:42:12.442026	ALL	USER_PERMIT	2 A T-F
ALL	15-06-15 12:38:56.901236	ALL	USER_PERMIT	2 B F-T
ALL	15-06-15 12:38:56.901236	ALL	USER_PERMIT	2 A F-T
ALL	15-06-15 12:38:56.671410	ALL	USER_PERMIT	2 B T-F

The log window also has a "Filters" section with a checked "Expert registers" checkbox and a "Source Selection" section with "Live" and "Freeze" buttons.

# Illustration (2)



Roman Pot Control Application (Device: XRPV.C6L5.B2/45-210-N-T/B)

File Settings Reset More displays Help

Jaw corners Increment BBA

**Set Roman pot positions**

TOP (LD) [um]

BOTTOM (RD) [um]

Applying new jaw positions

TOP  IN  HOME  OUT

BOTTOM  IN  HOME  OUT

Anti COLL

**Positions readout from the low-level**

	LVDT	Motor	Resolver
Top	38785	35001	38771
Bottom	-40644	-35000	-40641

Display jaw:  Top (dashed)  Bottom (solid)  T&A

Positions:  Set  LVDT  Warn  Lim  Res  Mot  IPL

BLM:  BLM 1  BLM 2  BLM 3  BLM 4  LogY

Int. Time:  1.31s  81.92ms  12 Hz  Threshold

**Views**

Beam loss data [16/06/15 09:44:28]

**Jaw positions [16/06/15 09:44:28]**

Console

09:43:01 - Start set-up for update of motor positions to LVDT readings  
09:43:02 - Done!

No Exception to display...

dump with Top pot

warning (extraction)  
with Bottom pot

# Summary of Test Results



- No PXI crash since the fix (Thursday 11 June, evening)
- No non-conformities in interlock functionality observed
- Remaining operational annoyances:
  - execution of motor resets by sequence still leads sometimes to time-out in receiving the PXI acknowledgement, but command always correctly executed
  - same problem for new inner limits

# Interlock Logic 2015

IN MOTOR CONTROL RACK

TOTEM INTERLOCK BOX

CMS S1E08

