CT-PPS Experience during Intensity Ramp-Up; Recent Auto-Retraction

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MPP Meeting
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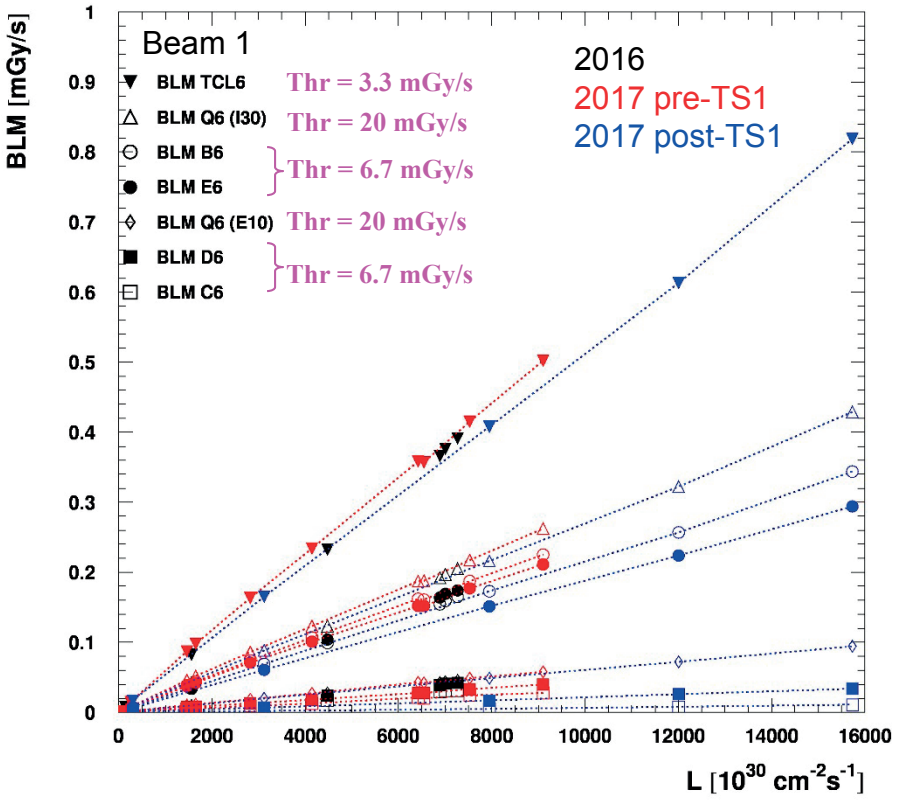
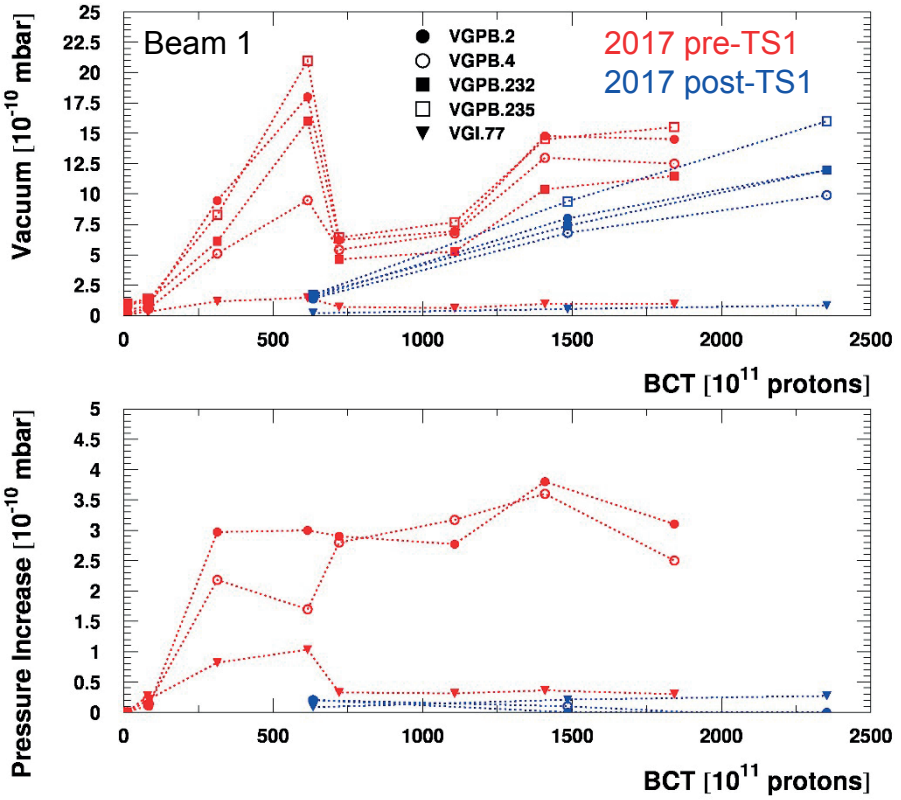
Intensity Ramp-Up

- **Up to the highest LHC luminosity: L = 1.6 x 10^{34} cm^{-2} s^{-1}**
- 2 ramp-up periods: before and after TS1
- without any problems (except 1 interlock problem → later)
  - BLM signals in line with 2016
    (at least factor 3 below thresholds)
  - very good vacuum levels
  - benign temperatures
  - no impedance problems

BLMs



Vacuum

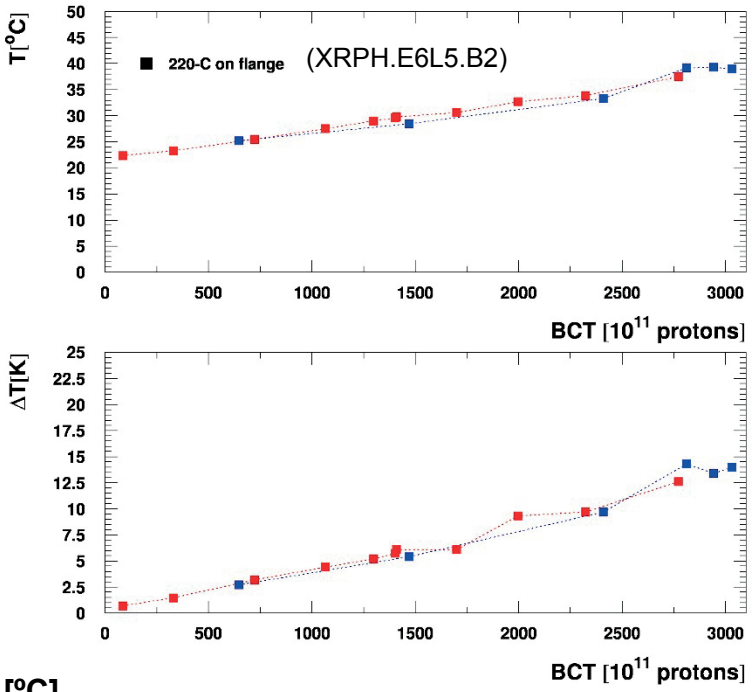


Vacuum dominated by other systematics,
not primarily by beam current.

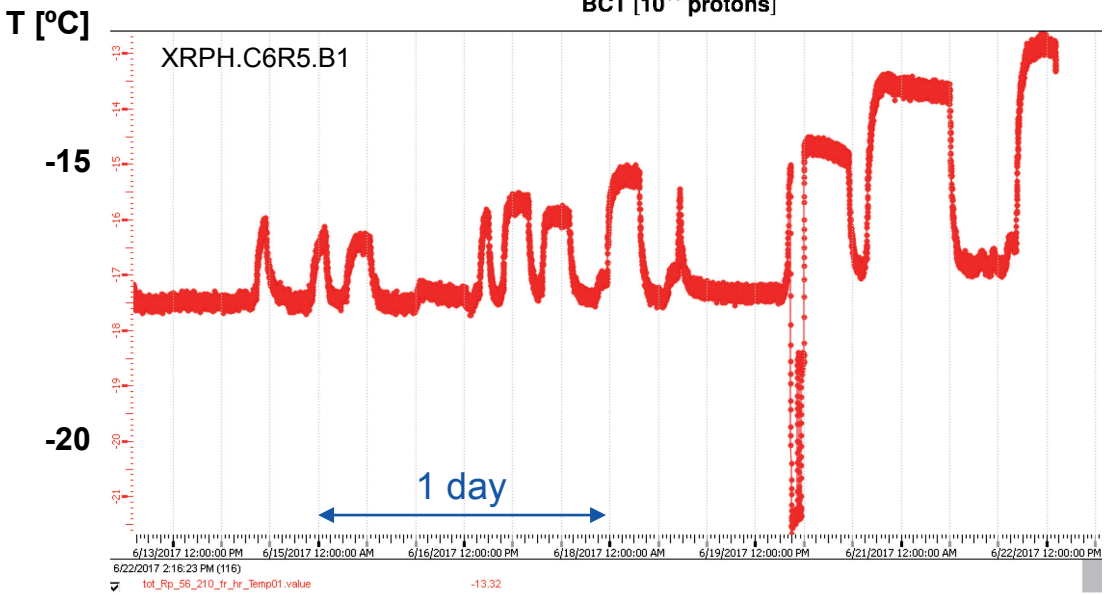
Intensity Ramp-Up (2)

Temperature vs. Beam Current:

on XRP flange (not directly cooled)

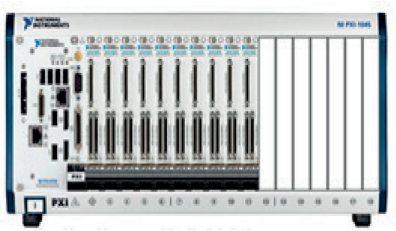


on detector hybrid (cooled)



Interlock Problem and FPGA Firmware Modifications during TS1

24 June: spurious dump by movement interlock,
TIMBER logging time resolution not fine enough → no malfunction found
→ Implementation of an LVDT filter and a post-mortem diagnostic system
(see MPP 07.07.2017)



PXI for motor control :
- RS485 communication with motor encoder,
- DIM communication to DCS and CCC,
- Resolver measurement and calculation,
- Motor control.

➢ No modification for this part during TS1

OPCUA Data exchange :

- Limits for interlocks

- LVDT Positions

1 2

PXI for RP position:
- LVDT measurement and calculation,
- Interlock generation according to Warning, Critical or Inner limits.

Modifications implemented during TS1:
➢ Real time part (1):
➢ Generation of a post mortem file after an interlock generation (1s before and 1s after).
➢ FPGA part (2):
➢ **Interlock Generation if conditions are valid during three consecutive loop iterations of 10 ms each** (same as AFP and ALFA)

i.e. only if the dump threshold was crossed! Crossing the warning threshold does not trigger a post-mortem file. **To be improved.**

Observations after the FPGA Modifications

No post-mortem file was ever generated.

Dump threshold was never crossed since TS1.

But:

11 Sept., 17:51 h: Spring extraction of all XRPs during Stable Beams without apparent reason,

- no interlock
- no suspicious LVDT activity in TIMBER
- no post-mortem file generated (i.e. dump threshold was not crossed)
- also: crossing the warning limit extracts ONLY the violating pot

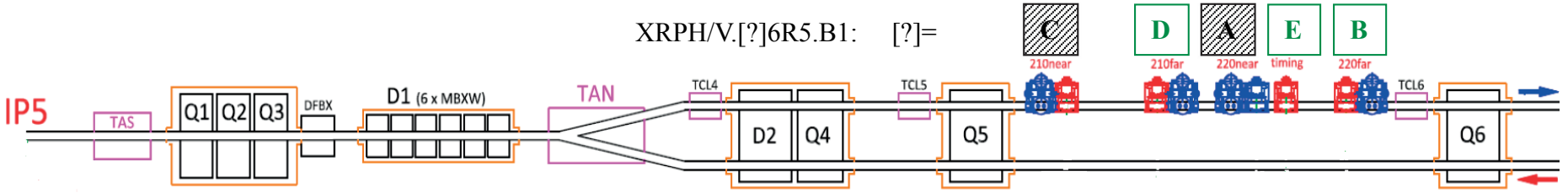
→ last conceivable option: signal glitch somewhere (e.g. STABLE_BEAM flag to interlock box)

Future improvement (Christmas shutdown):

- generate a post-mortem file already at a crossing of the warning limit
- think about additional loggings (e.g. SMP flags received)

Restart after TS2

- Alignment of all operational XRPs due to optics change and TS2 interventions: **done**
- Calibration data at 3 crossing-angles: 150, 130, 110 μrad: **ongoing**
- New physics settings: TCT + 3 σ + 0.3 mm = 11.5 σ + 0.3 mm



Horizontal:

- C units: empty, unused for the full year
- D units: used in all fills
- A units: empty, unused for the full year
- E units: used in all fills
- B units: used in all fills

Vertical:

- D and B units inserted in calibration runs,
- A and C units empty, unused.

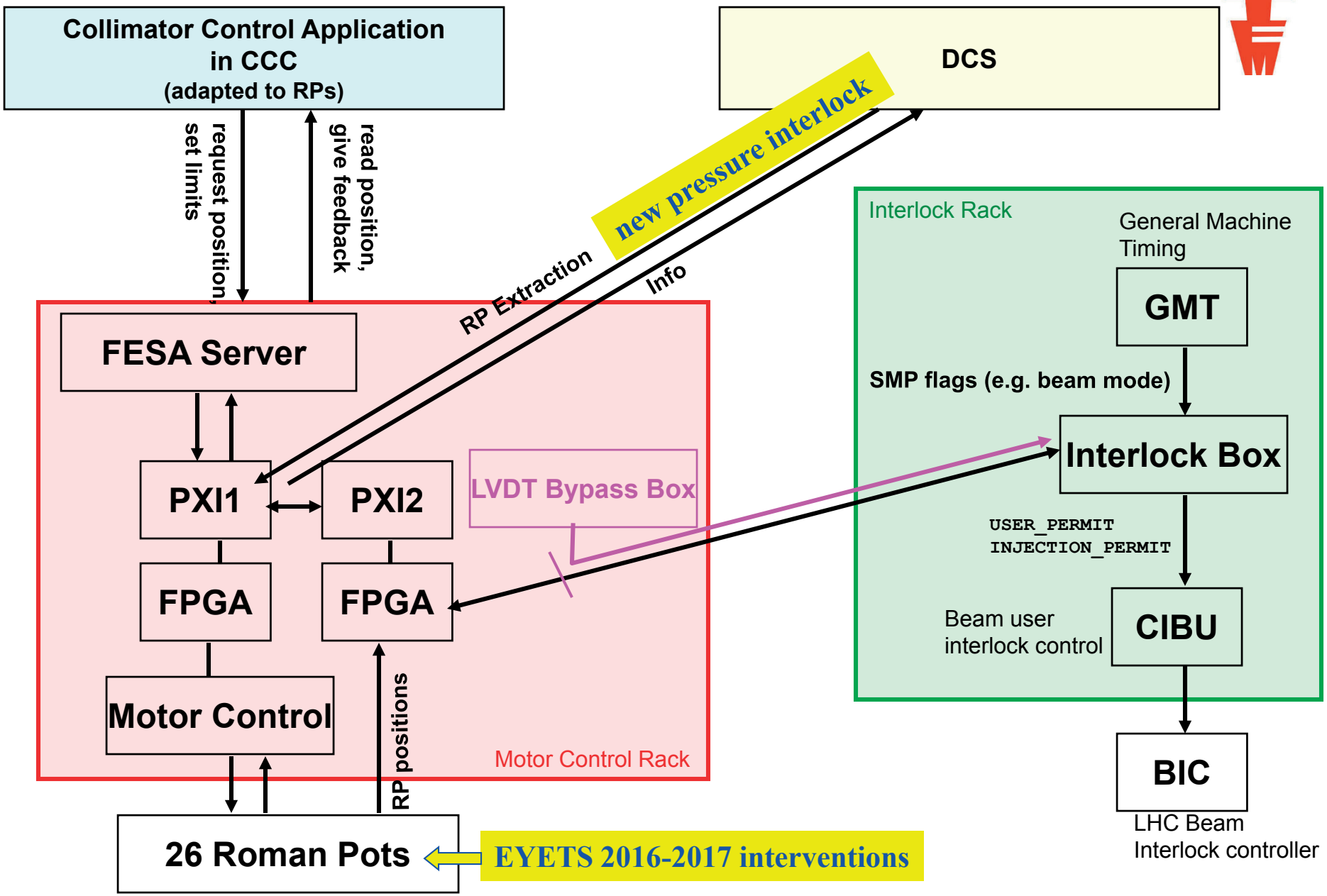
Hardware groups (since TS1, unchanged):

- 1 global group and sequence with all pots used in normal fills (horizontal D, E, B)
- 3 subgroups with related sequences for flexibility (detector problems / limit irradiation): COLLIMATORS_XRP_TOTEM_LOWBETA_B / D / E

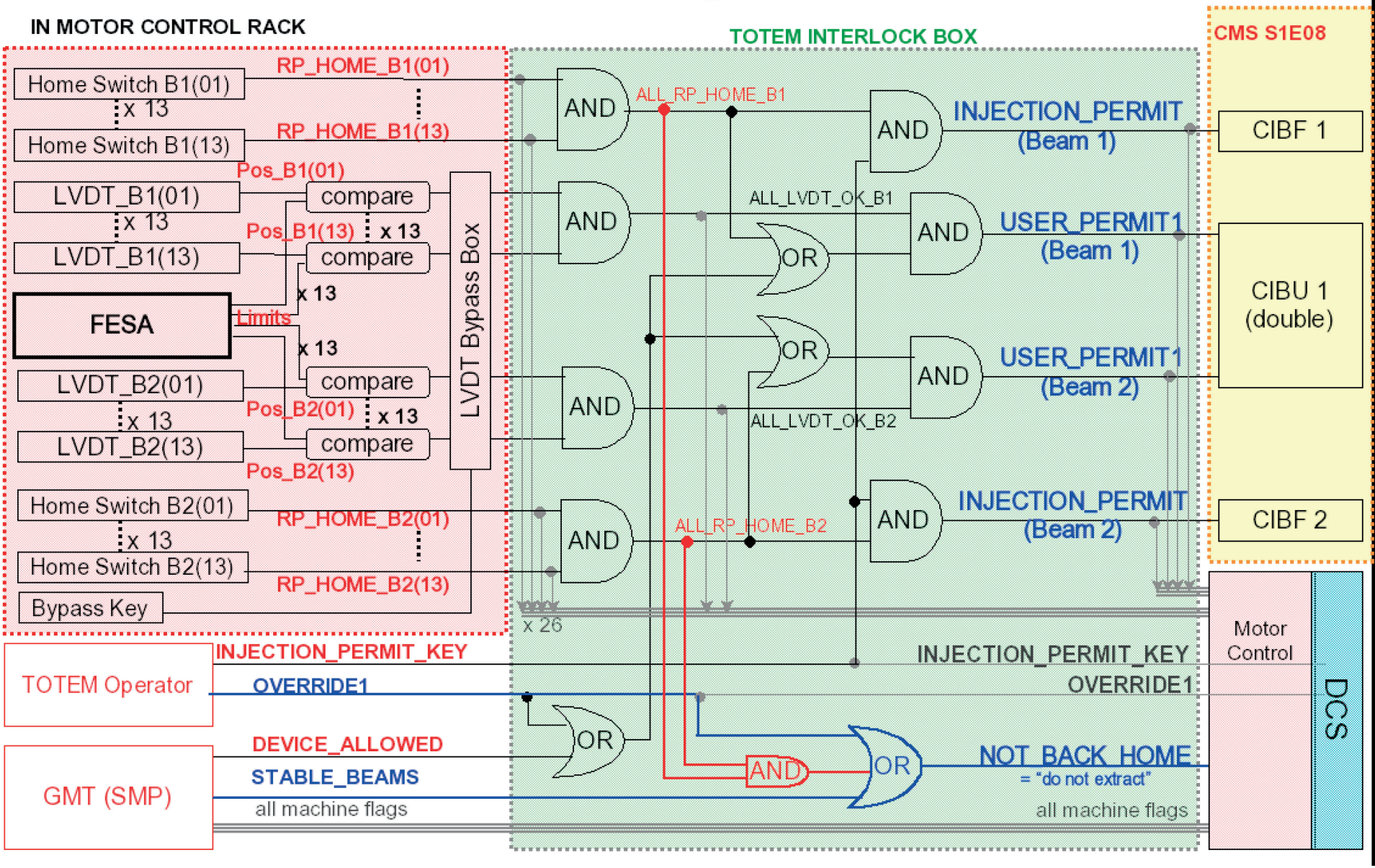

TOTEM

Additional Material

Movement System Architecture (strongly simplified)



Interlock Logic 2015



Interlock Logic 2015
(Zoom on the motor control)