Status of MP checks for the LHC collimation system

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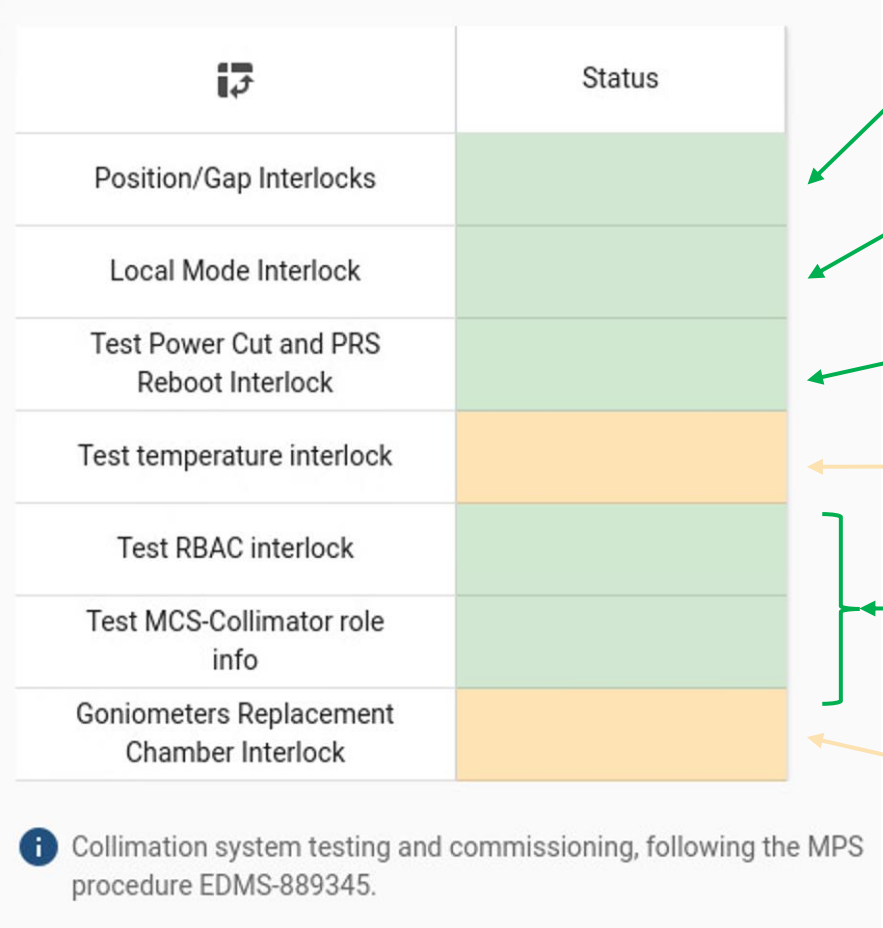
234th Machine Protection Panel Meeting

Overview MP checks



	Status
Position/Gap Interlocks	
Local Mode Interlock	
Test Power Cut and PRS Reboot Interlock	
Test temperature interlock	
Test RBAC interlock	
Test MCS-Collimator role info	
Goniometers Replacement Chamber Interlock	

Collimation system testing and commissioning, following the MPS procedure EDMS-889345.

- ✓ Position, energy, β* limits of all ring collimators tested and validated
- ✓ Local mode interlock carried out for one collimator per beam in each IR
- ✓ PXI of ALL ring, inj. prot, TL collimators rebooted and interlock validated (following LS2, otherwise 1 coll per PXI)
- • Temperature tests ongoing
- ✓ No devices in the inconsistency list found with Parameter Configuration Application
- • Interlock on replacement pipe to be tested asap
- • Interlock threshold function limits tested and validated
  - ➢ To be repeated for TCPCH.A4L7.B1

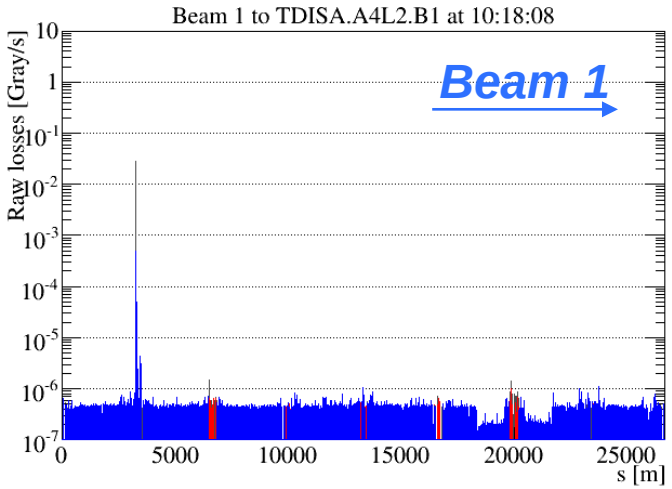
Links to the elog and collimation web page with detailed information in the checklist

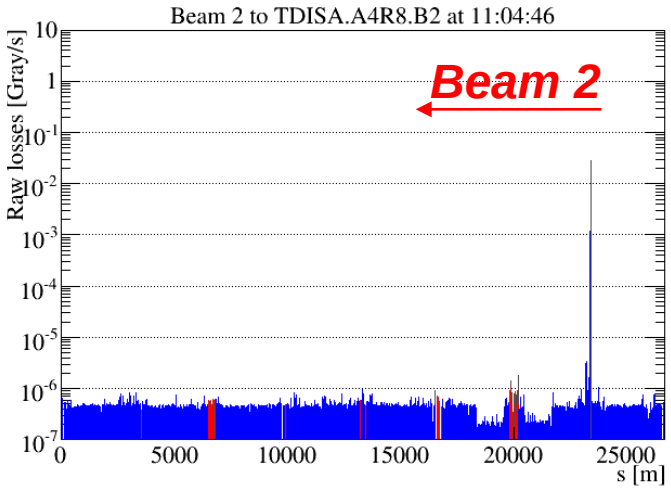
Status waiting for first beams – Threading

- Beam left “circulating” step-by-step: collimators used to stop the beam in each IR (except IR4…)

a.k.a. Threading

Beam 1	Beam 2
TDIS[A|B].A4L2.B1	TDIS[A|B].A4R8.B2
TCP.6L3.B1	TCP.B6R7.B2
TCTPV.4L5.B1	TCSP.A4L6.B2
TCSP.A4R6.B1	TCTPV.4R5.B2
TCP.B6L7.B1	TCP.6R3.B2
TCTPH.4L8.B1	TCTPH.4R2.B2
TCTPH.4L1.B1	TCTPH.4R1.B2





Ring coll. at: LD = 0.5mm, LU = -1mm, RD = -1mm, RU = -2.5mm
TDIS[A|B] at: L = [4.0|-2.5], D = [2.5|-4.0]

BP and sequences tested and ready for first beam

Status waiting for first beams – Coarse settings

- **Reduced set** of collimators at **COARSE settings**

Assuming no surprises** will be found in **aperture measurements!

Collimator	IR	Setting		
		Inj.	FT (first ramp)	FT (if squeezing)
TCP (H&V)	7	8 σ	20 σ	9 σ
TCSP	6	9 σ	25 σ	9 σ
TCP	3	12 σ	30 σ	30 σ
TCTP	1/2/5/8	±15 mm	±15 mm	10 σ/±15 mm/10 σ/15 σ (@30cm)
TCDQ	6	20 mm	20 mm	20 mm

✓ **Linear interpolation** of settings from **injection to FT**

✓ **Two set of FT settings** defined whether or not beams get squeezed: **collimators kept fixed after reaching FT**

BP and sequences for coarse settings being prepared

Main change w.r.t. previous years: E/β*/IPL settings will be stored in a dedicated DISCRETE BP, to increase flexibility while keeping safety (COLLIMATORS category is RBAC protected)

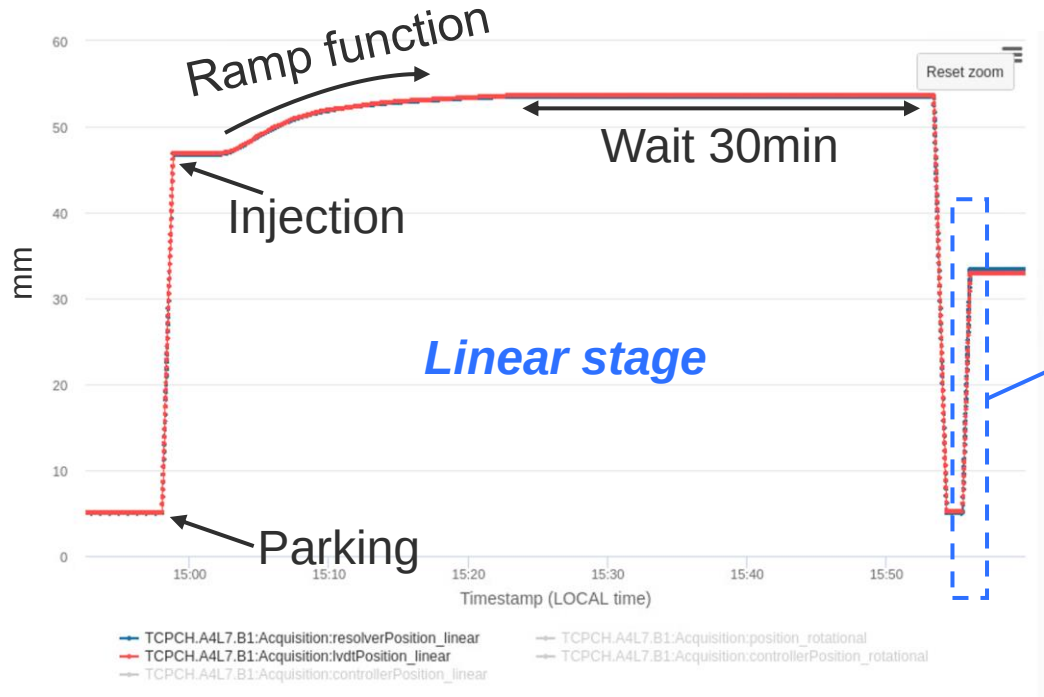
Status of TCPCH.A4L7.B1

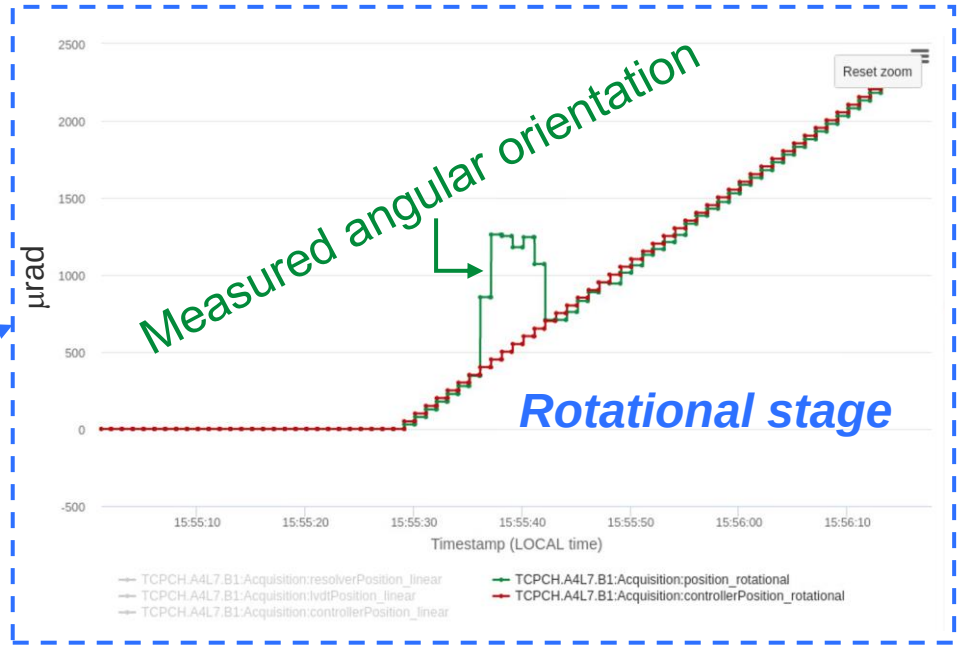
- **Stress test**: **representative** movement along **operational cycle** repeated **over and over**

  Performed for **all collimators**: transfer lines, injection/dump protection, ring

  Considered **successful after >50 cycles** (~1/3 of cycles in 1 year) performed without latching any fault

Goniometers used to operate crystals feature both linear and rotational stages: both stressed





Extremely precise devices with **<1µrad stability** during motion: **~1mrad deviation** observed ~20s earlier than linear stage failure

Possible indication of mechanical issues on linear stage

Recovery of TCPCH.A4L7.B1

- **Intervention** confirmed **severity of the fault**

  Linear stage derailed from bearings

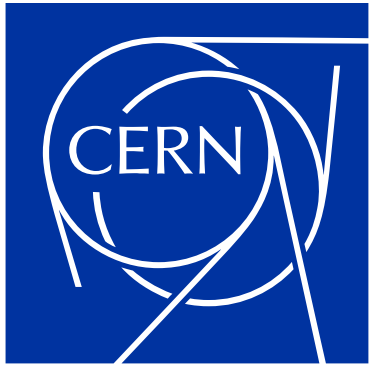
  Device removed from the tunnel for intervention in clean room

- **Actions** taken:
  - ✓ **Linear stage replaced** yesterday
  - ✓ **Controls** commissioning **starting today**
  - ✓ **Validation** and **stress test** planned on **Monday**
  - ✓ **Installation** planned on **Tuesday**

OUTDATED

Installation delayed to TS1

- *Root cause still under investigation:*
  - ➢ Spectrum of crystal vibration to be considered as potential observable for future commissioning



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