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LHC machine status

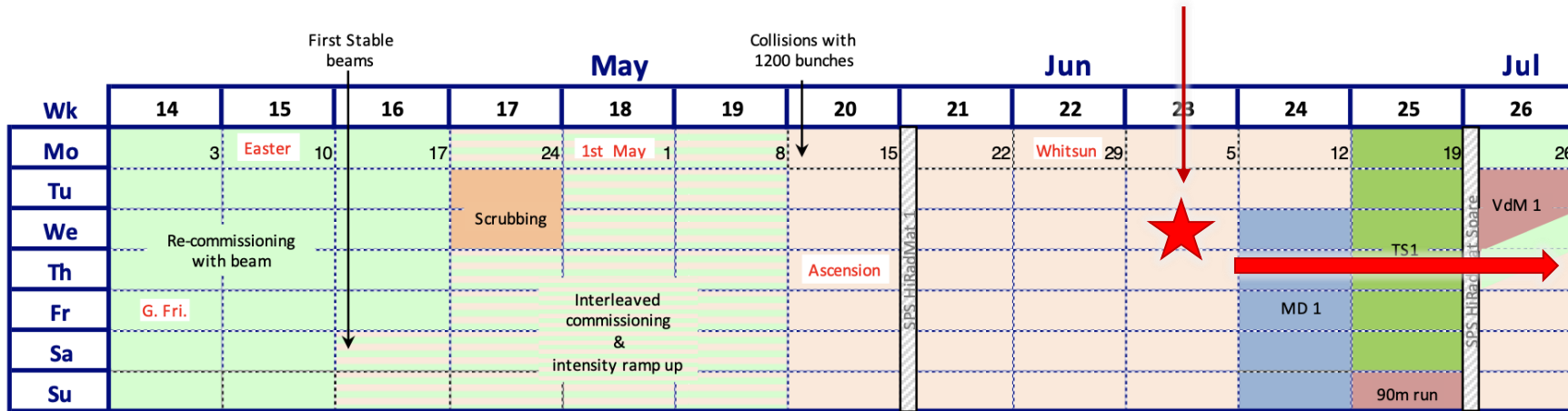
Matteo Solfaroli

*BE Department
Operation Group*

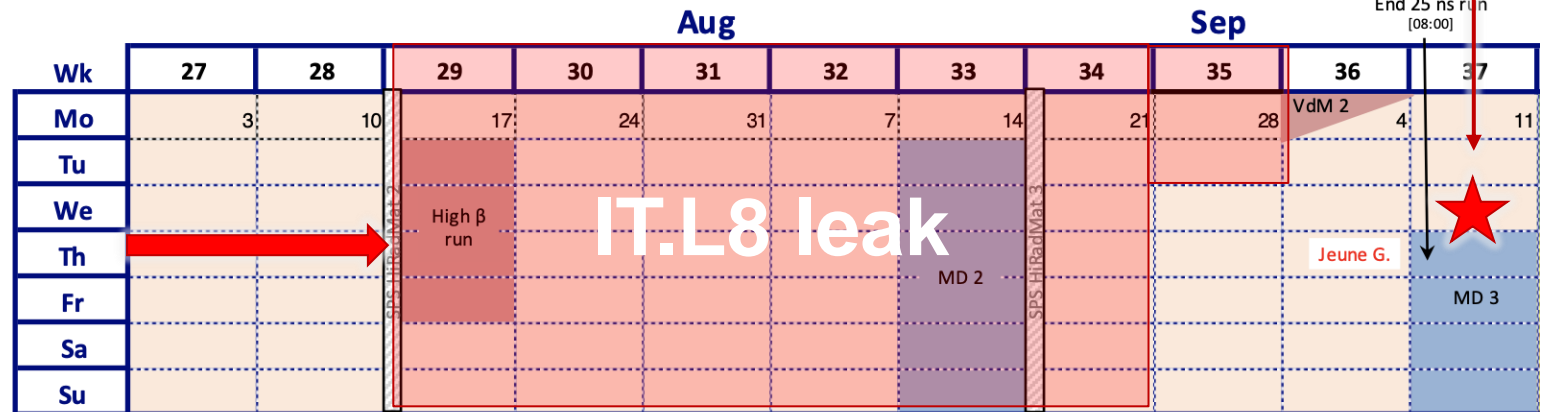
On behalf of the LHC team

Schedule

Last LHCC open session



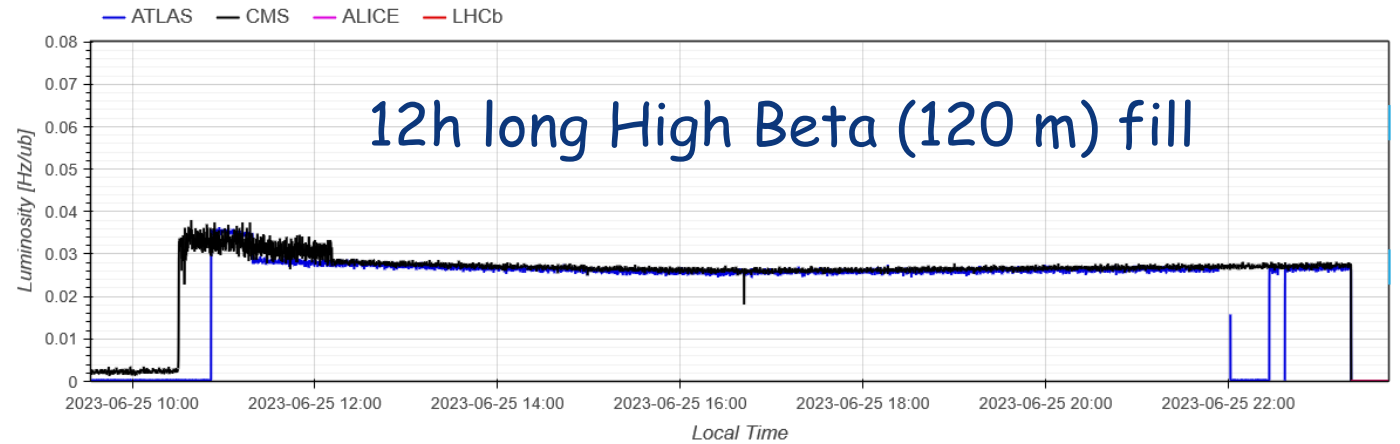
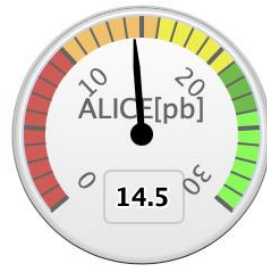
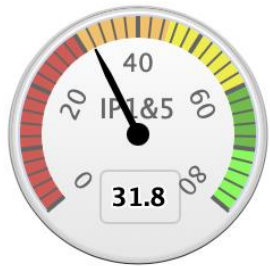
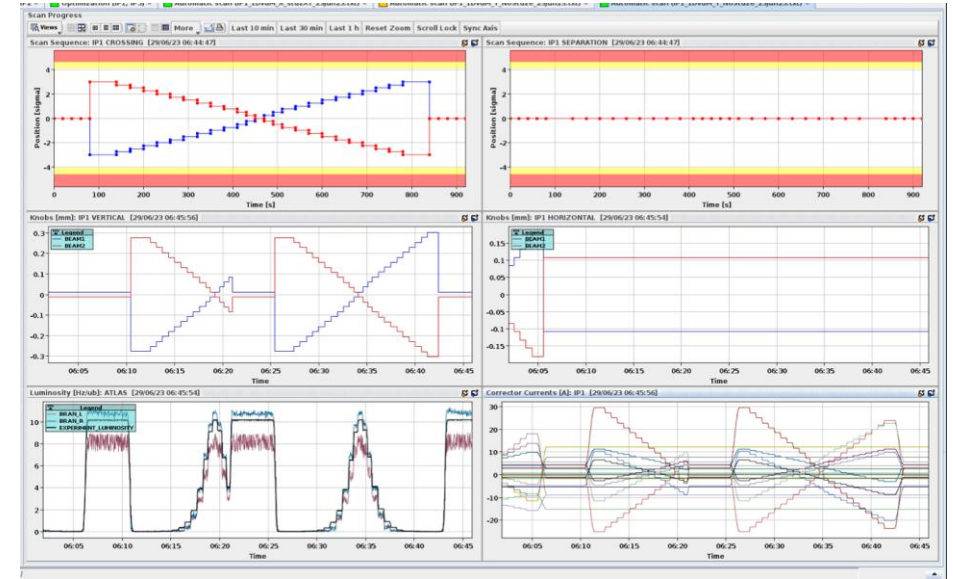
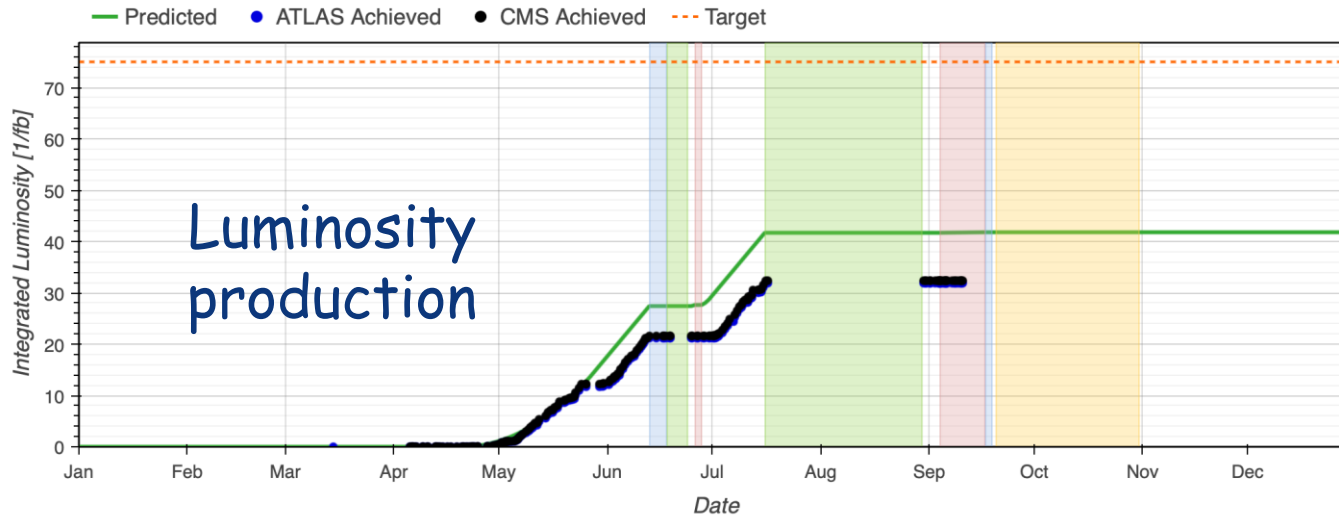
- pp physics - ~3 weeks
- MDs - 5 days
- TS#1 - 6 days
- High Beta (120m) run
- VdM



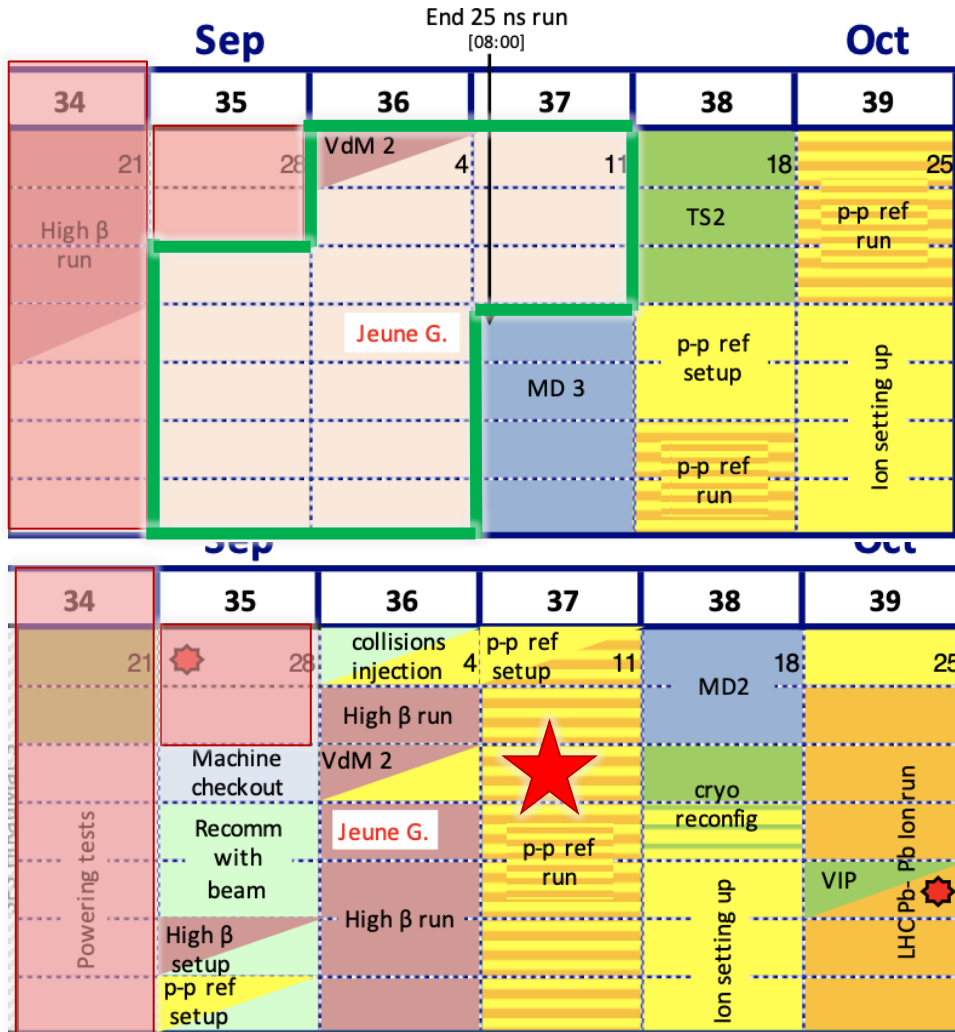
Vacuum leak following a quench made the D1 and RQX magnets non-operational see S. Le Naour's presentation for details

Before IT.L8 leak

7h + 24h VdM program
(ex. ATLAS)

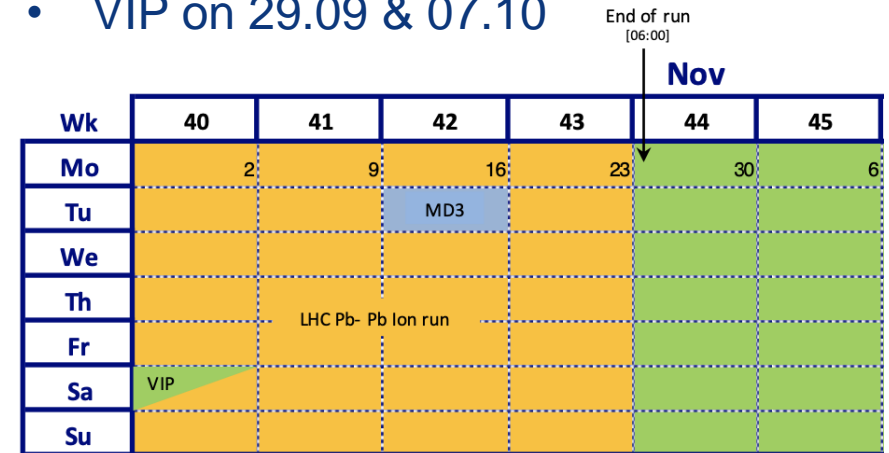


New schedule proposal



21 days of pp physics to allocate:

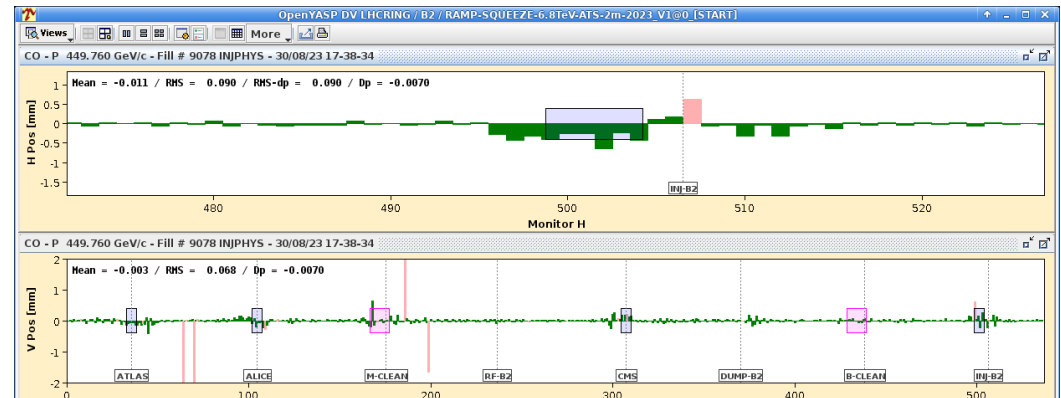
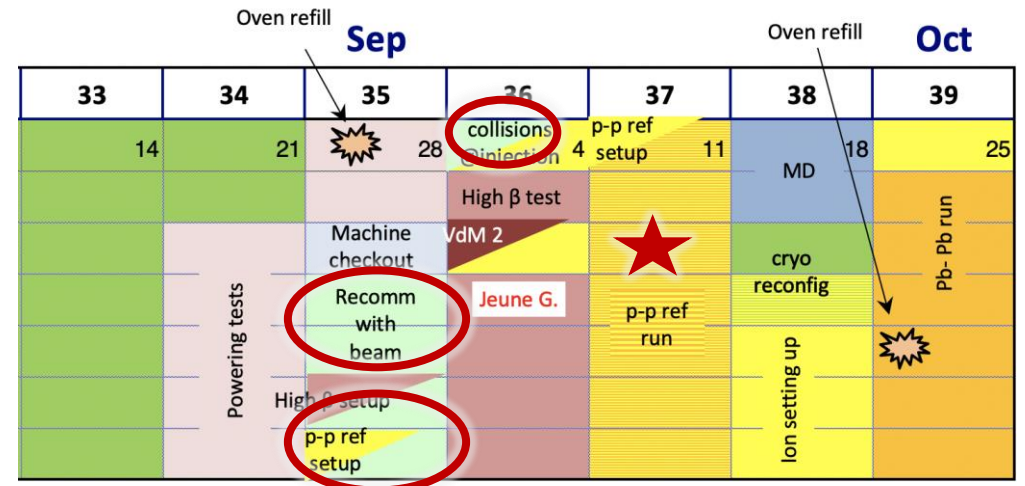
- 4 days re-commissioning
- 4+1 days HB
- 1 day VdM
- 2 additional days of pp ref
 - VdM+intensity ramp-up
- 2 days MD
- 1 day CRYO reconfiguration
- 7 additional days to IONS run
 - VIP on 29.09 & 07.10



Following the IT.L8 leak repair, a new schedule was approved in LMC on 23rd August

Re-validation of pp nom cycle

- **Impressive reproducibility**, beams circulated at the first attempt (H orbit distortion from magnet movement smaller than expected)
- B2 injection protection validated
- Aperture measurements
- Optics measurements
- Sub-set of **Loss Maps** (validation)
 - Consistent with 2023 commissioning results
- **Collisions** re-established
 - Beams colliding in IP1/2/5 (~80 micron steering in IP8)

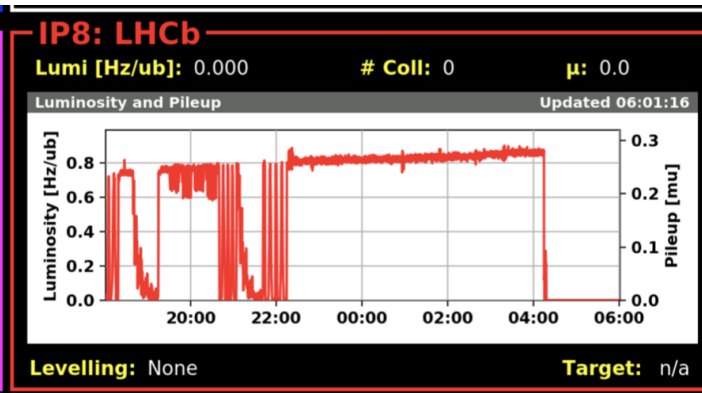
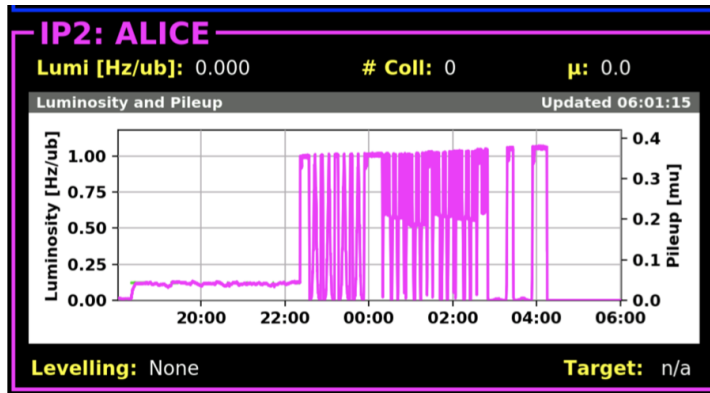
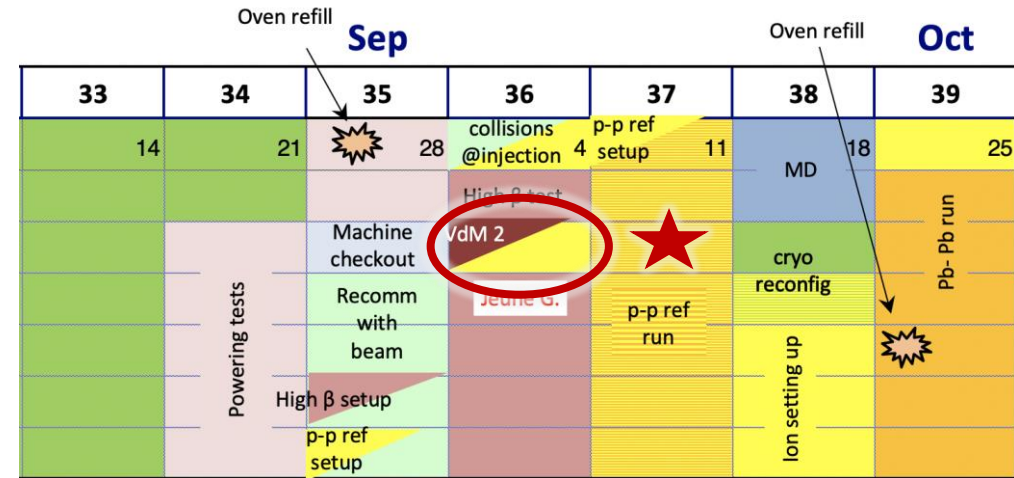


VdM



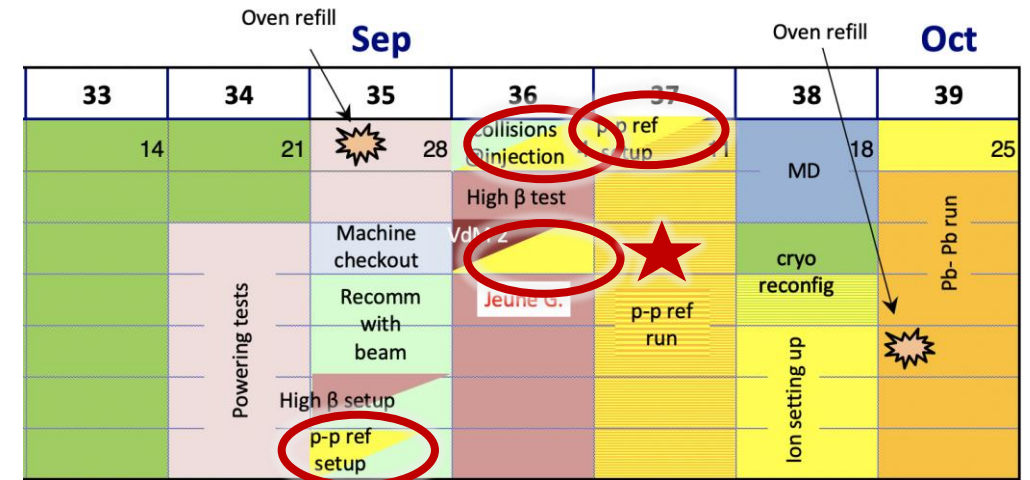
Cycle was last used **beginning of June**

- Smooth “re-commissioning”
- Full plan for **ALICE** and **LHCb** completed
 - 5h of LHCb scans, 4h of ALICE scans
 - Low PU running for ATLAS (parasitic)



ppref

- Energy: 2680 GeV per beam
- Beta* = 3.1m in IP1/5/8, 10m in IP2
- Bunch intensity: 1.4×10^{11} ppb

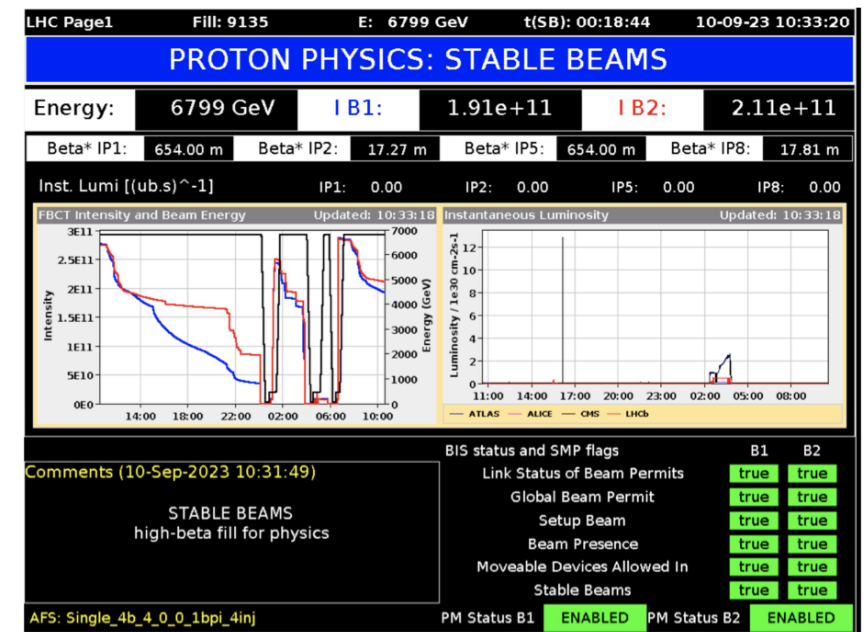
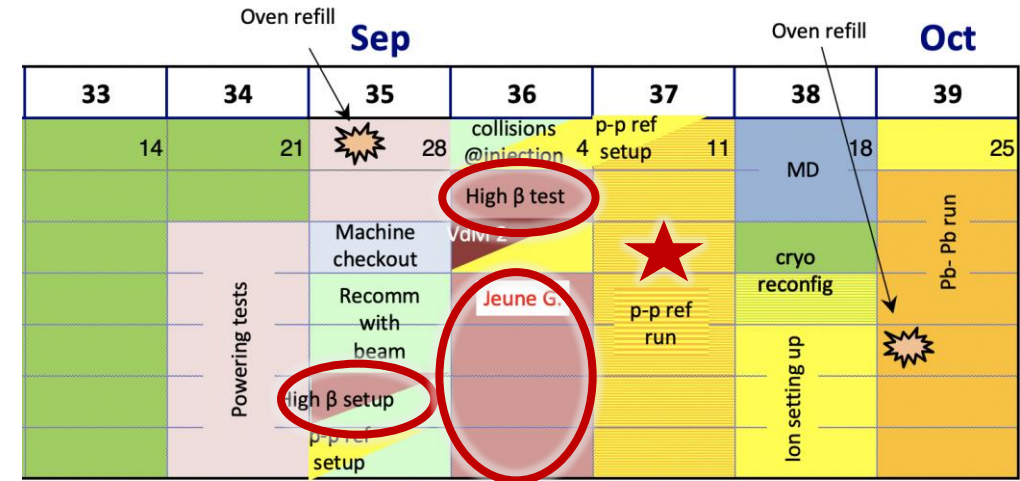


Brand new cycle

- Cycle fully **commissioned & validated**
- **Ready to start**
- Feasibility to be assessed (see later TDIS problem)

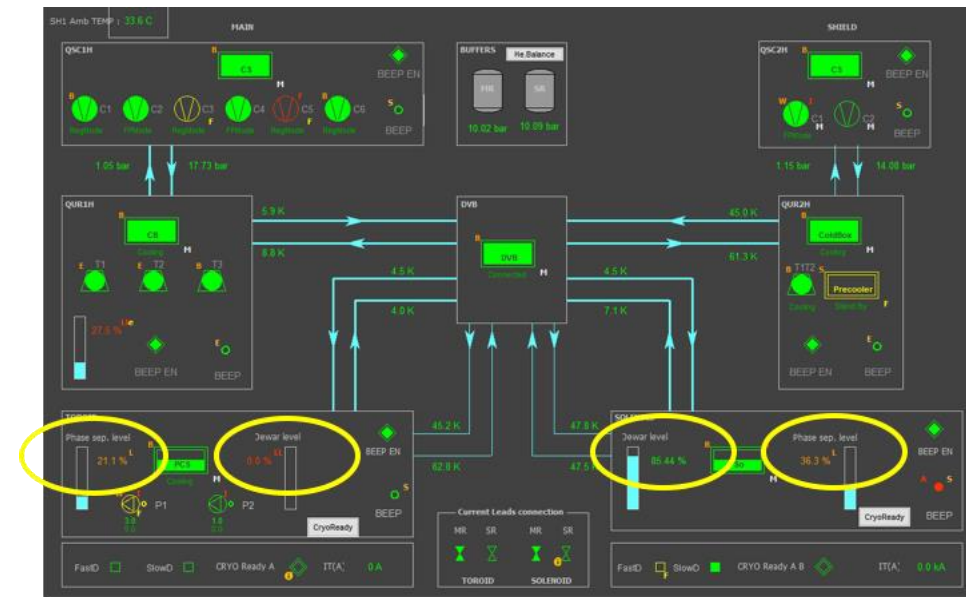
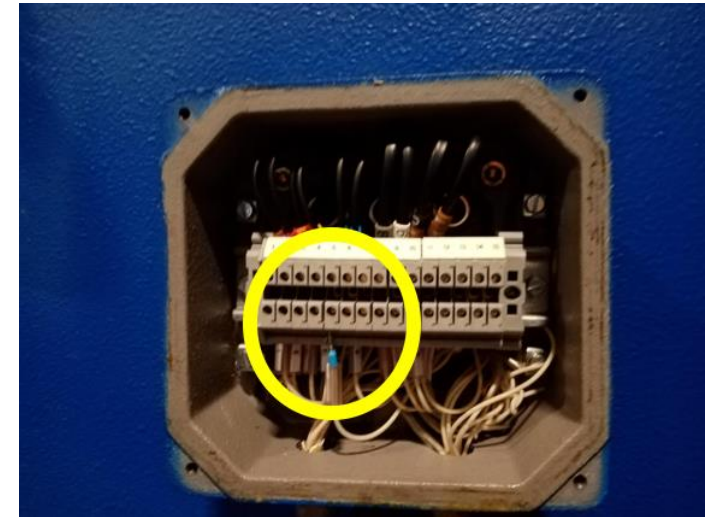
High Beta

- Cycle until **120m used** in June
- Squeeze to **3/6 km: commissioned**
 - beta-beat at 3km up to 110%
- **ALFA&TOTEM pots aligned**
- **Background test done**
- **Large scraping** → low intensity beam
- **Beam instabilities**, due to very complex machine configuration
- **Crystal collimators** used in H and V planes
- **Run ongoing** (waiting for cryogenic conditions on ATLAS solenoid)



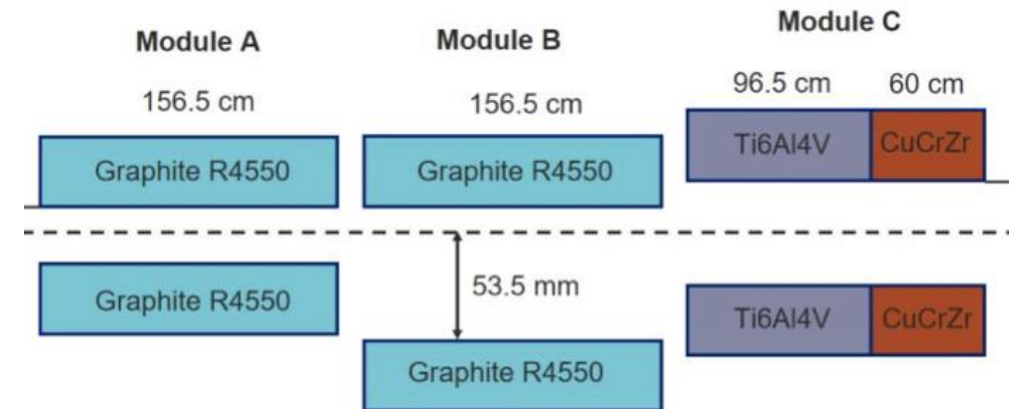
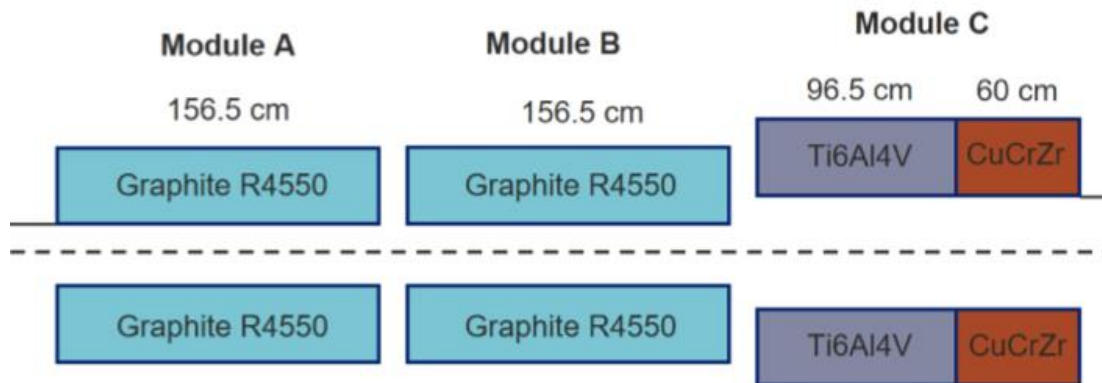
ATLAS solenoid cryogenic

- ATLAS main refrigerator compressor station stopped at 2:53 pm on 11.09, due to a **loose wire**
→ **Repair** was performed, and compressor restarted
- **ATLAS toroid** went to slow dump
- **ATLAS solenoid** experienced a fast dump, due to no flow in the current lead
- In such situation, ATLAS solenoid is fed by the Solenoid Dewar (~90 hours of autonomy)
- **Investigation** of the causes of fast dump in progress
- Toroid and Solenoid are being filled: **cryo conditions** will be granted by **Thursday (solenoid today)**



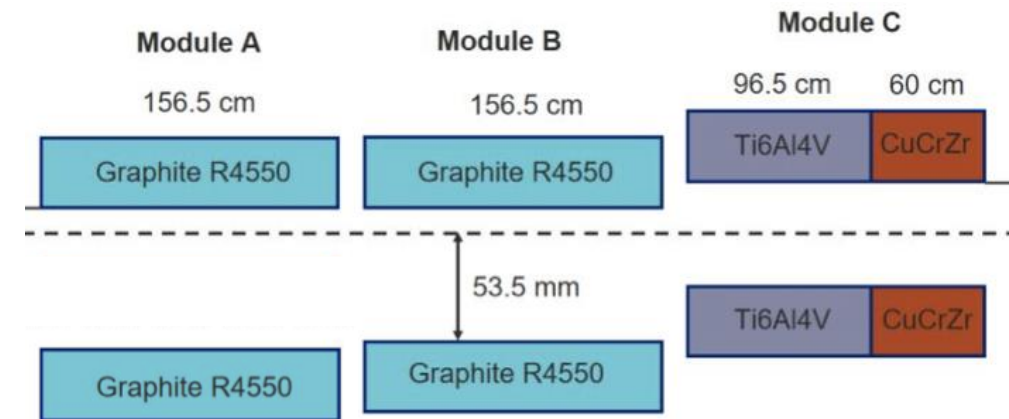
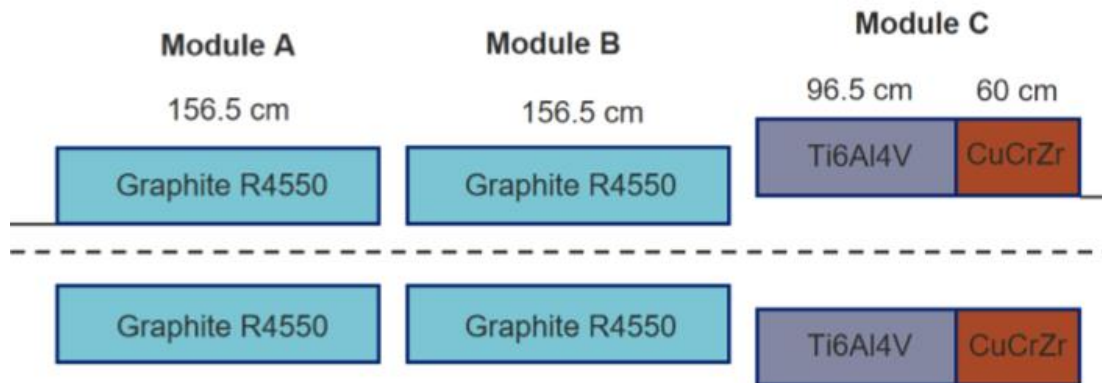
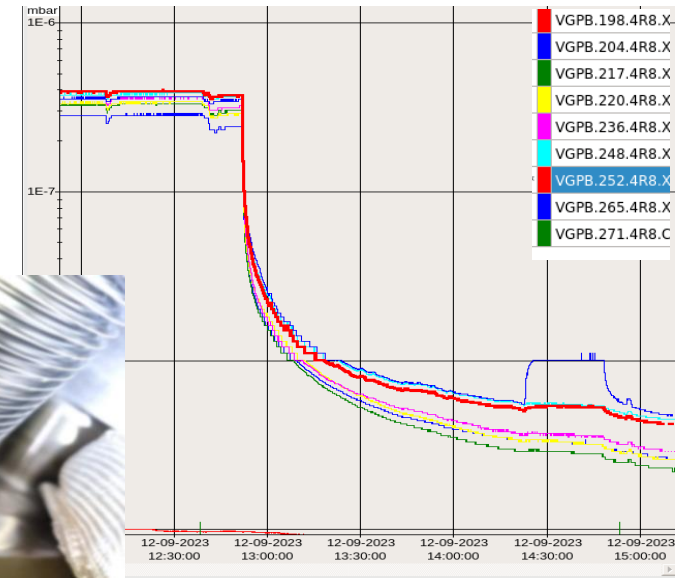
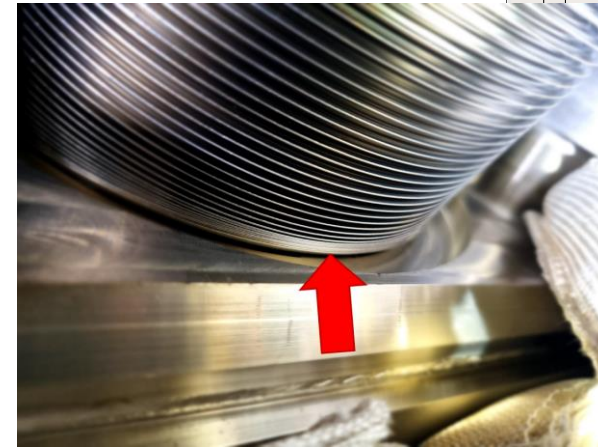
TDIS-IP8

- A **vacuum leak** developed on IP8-TDIS (injection protection device), starting on 1st September - degrading at every cycle
- **Leak** at the level of module B, bottom jaw, downstream bellow
- Leak varnished and jaw blocked in open position: **degraded injection setup**:
 - ➔ **slightly reduced** number of bunches for **ppref run** (impact on filing scheme)
 - ➔ **NO intensity limitation** for **IONS run**



TDIS-IP8

- An **additional leak** developed on IP8-TDIS (injection protection device), starting on 8th September
- Investigation revealed a **leak** at the level of module A, bottom jaw, upstream bellow
- Leak was **varnished** and jaw **blocked** in open position



Options

Problem in the present configuration comes from the amount of **circulating and injected beam** (erratic kicker firing):

- **Operational limitations** in present configuration to be established (simulations ongoing)
- Anticipated **IONS commissioning** (very low intensity operation possible)
- **Complete High Beta run** when ATLAS solenoid is back
- If limitations too large, **exchange TDIS**
 - time estimate 8/9 days +10 days for cryo manipulation, if required for safety (risk analysis ongoing)

	36	37	38	39
collisions @injection	4	p-p ref setup 11	MD 18	25
High β test				Pb-Pb run
vDM 2			cryo reconfig	
Jeune G.		p-p ref run	Ion setting up	

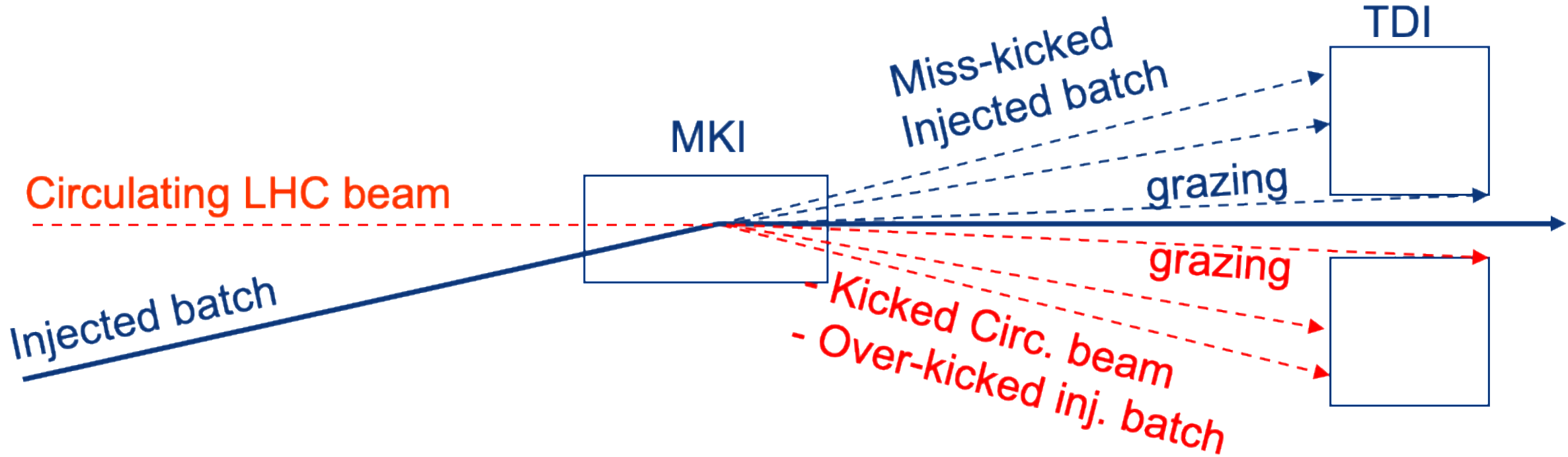
Oven refill Oct

Conclusions

- **Very quick recovery** after the IT.L8 leak repair
 - LHC proved (ONCE MORE!) to be a very **reproducible machine**
- Very intense period with **validation of all planned configurations**
- **High Beta run** ongoing
 - will be completed by the end of the week
- Plan for the rest of the year (**pp ref and IONS run**) will be adjusted in the light of the results of the simulations and risk analysis

BACKUP

TDIS



TDIS

