

Highlights

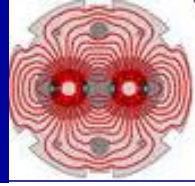
Session 1: MPS operational experience (2008 – 2012) and outlook

An aerial photograph of a rural landscape with green fields and some buildings. A blue rectangular box is overlaid in the center, containing white text. The background image also features some faint white lines and dots, possibly representing a flight path or a map overlay.

T. Baer, D. Wollmann

Thanks to all the speakers and the audience for vital discussions!

- **MPS issues and MP approach concerning operation and MDs. (M. Zerlauth)**
- **Performance and availability of MPS 2008-2012. (B. Todd)**
- **OP view on handling of MP issues. (G. Papotti)**
- **Global vision of MPS after LS1 and beyond. (R. Schmidt)**



- 3499 dumps since 10.2009.
- MP systems worked well during run 1.
- No severe equipment damage with beam.
- But also (major) safety issues encountered (examples see slides).





MPS issues and MP approach concerning operation and MDs. (M. Zerlauth)

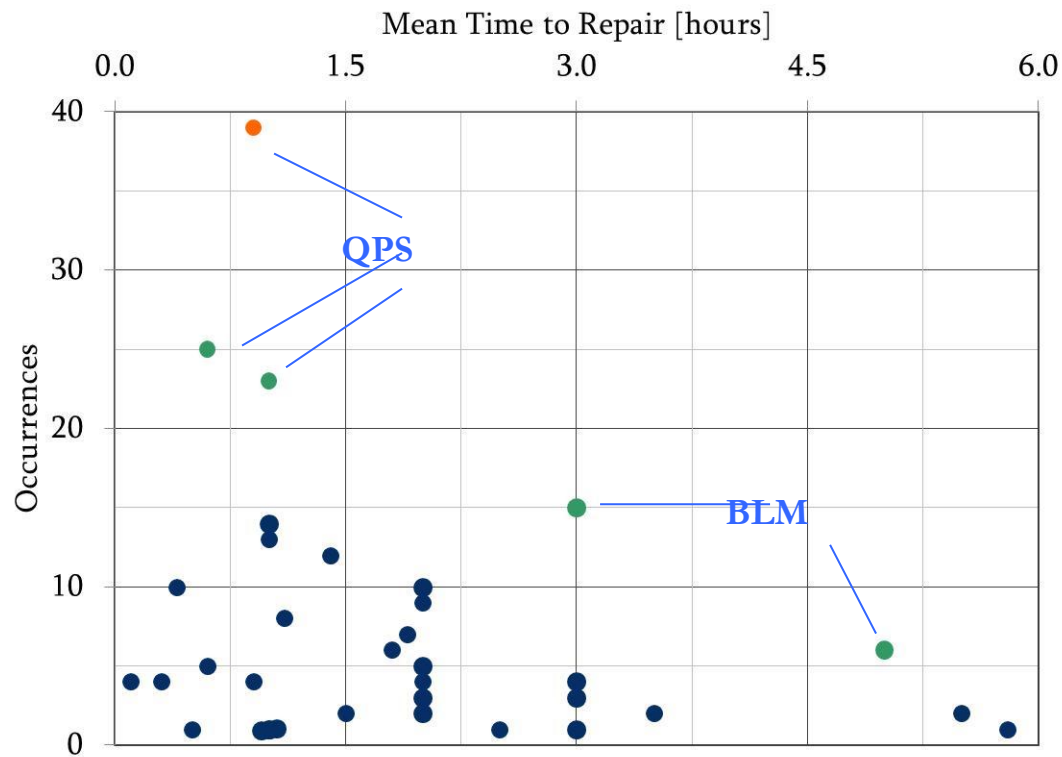


- **rMPP after LS1** with updated membership and improved follow up?
- **Interplay of MPP and MP3** for performance of magnet powering system to be defined/improved for post LS1?
- **MP responsible** for LHC restart in 2015 (Contact for operation crews, documentation, follow-up of operational issues, ...)?
- **Commissioning & changes** during production:
 - more dependable + automatic sequencing, dependency tracking + follow-up (ACCTEST framework).
 - define and enforce minimum (non-negotiable) validation costs of changes.
- **MDs: improve efficiency and safety** by
 - MD - 4 weeks: Up-to-date MD request for ALL MDs.
 - MD - 2 weeks: EDMS doc for MD Class C + approval circuit.



B. Todd

- Reliability of the MPS:** 12-14% of physics fills aborted due to internal failures (>450GeV).
- Total 7 systems, >250 faults, 36 failure modes, >400h repairs.
- Hidden faults?** BIC: >50% of beam aborts come from 12 inputs (of total 275 inputs), 48% (136) inputs never triggered.
- Improved fault tracking** required.
- BLM account for 215 out of 1090 beam aborts. Can we **dump more directly on root causes?** (Defense chain).





- Failure catalogue:

- Failures **only** detectable **by experts**



- Failures detectable **by shift crew** (after dump / with beam in the machine)



- **Avoidable** dumps.



- What can help the shift crew (trade-off between MP and efficiency):

- **Automatic tools** to help detecting **abnormal situations**.

- **Procedures** (accessible, useful, up-to-date, more needed?).

- **Clear responsibilities** (e.g. MDs).

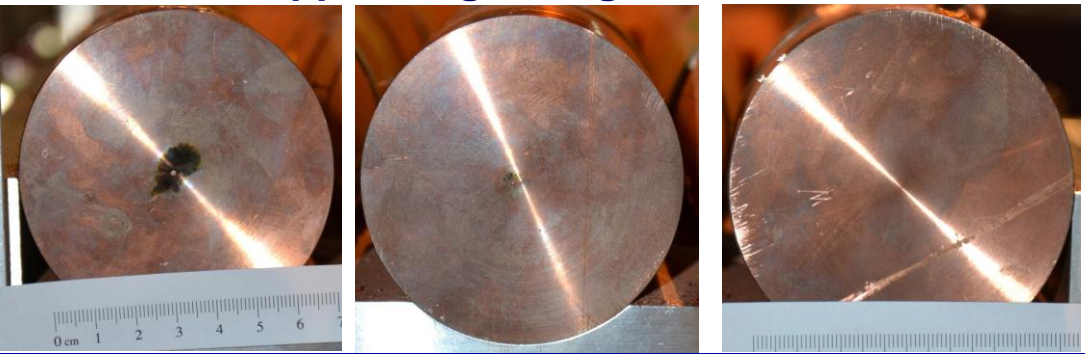
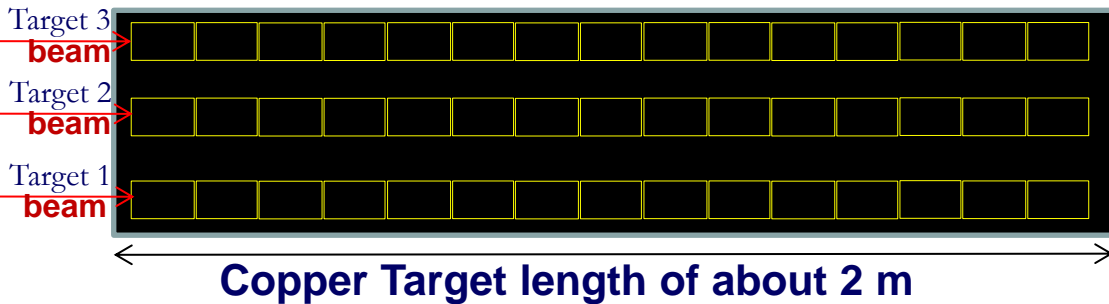
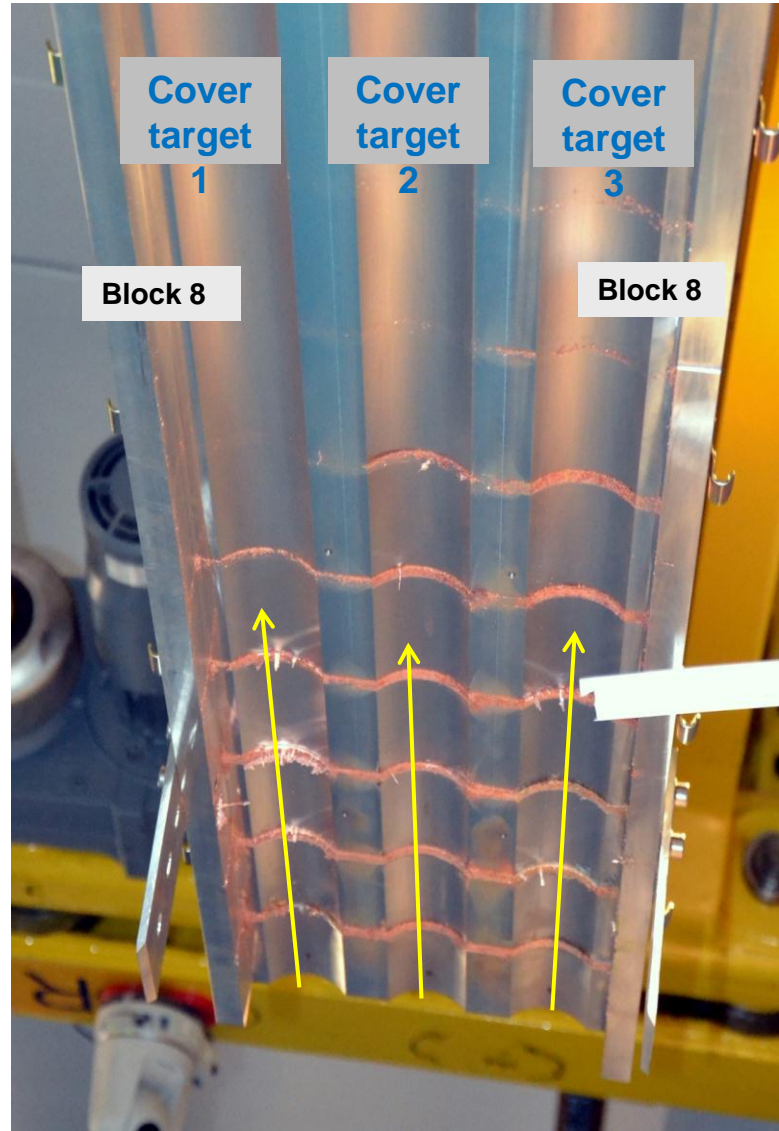


Global vision of MPS after LS1 and beyond.

(R. Schmidt)



- **Critical failure** scenarios for LHC (360MJ per beam):
 - Beam dumping system deflects beam with non nominal strength.
 - Beam dumping kickers are not triggered.
- Studies of beam impact on matter:
 - Hydrodynamic tunneling of beam through matter.
 - Experiment for Code validation.





Global vision of MPS after LS1 and beyond. (R. Schmidt)



Questions concerning most critical failure scenarios today and in the future:

- Does it make sense to further investigate the consequences of “catastrophic” failures?
- Does it make sense to investigate mitigation methods?
- Absorber blocks?
- Redundant kicker + absorber blocks?
- Are crab cavities introducing a new type of very fast failures?
- Can we protect the LHC efficiently if such failures occur?
- Should we continue using only robust collimators, or re-consider the materials if possible damage is understood and limited ... if we gain in overall integrated luminosity?
- Do we have to reconsider our protection strategy in case of missing beam halo?