



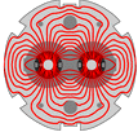
Session 6

Operation after LS1



Session 6

- Post LS1 operation – G. Arduini
- Update on beam failure scenarios – J. Uythoven
- Post LS1 Operational Envelope & MPS implications – M Solfarolli
- Software tools for MPS – K. Fuchsberger
- Interlocking strategy versus Availability – L. Ponce



Possible 2015 strategy

- Running period at 50 ns after short scrubbing run is desirable (could be at pile-up of up to 40 with β^* of 50 cm and close to nominal bunch intensity but low emittance) to re-discover the machine at 6.5 TeV,
- Move then to 25 ns after additional period of scrubbing (~10 days) and ramp-up in intensity
- β^* leveling is very likely to be used in some IRs (+ collision during [part of] the squeeze).
- The baseline scenario must be defined as we cannot implement all scenarios.
 - Study implications for OP and MP (collimation etc).



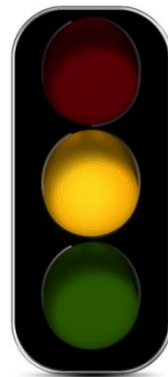
Injectors and beam heating

- BCMS schemes are very attractive but:
 - Average energy density at 450 GeV for 50 ns and 25 ns beams is ~35% and 70% higher than ultimate at injection
 - Average energy density at 6.5 TeV for 50 ns and 25 ns beams is ~2% and 25% higher than ultimate at 7 TeV
- Possible feed-down on the Setup beam flag !
- We need a 'body' to follow up heating issues – not necessarily MPP.
- We should identify issues at an early stage to put in place counter-measures before damaging equipment.



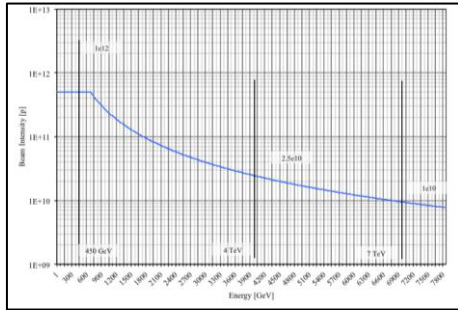
Update on beam failure scenarios

- The Big Three failure scenarios (D1, injection, asynch dump)
 - They all occurred, with some modifications !
 - However, *equipment weaknesses detected with equipment related to 2 oo 3 of the Big Three failure modes:*
 - TDI
 - LBDS – TSU and powering
- Unexpected failure scenarios occurred (as expected)
 - Timing system, beam heating, orbit bumps, UFOs, abort gap, QPS
 - We need to further improve our protection against these due to improvement of the equipment involved and surveillance
 - Heavily relying on SIS !
- Continue to understand each beam dump (post mortem) before continuing operation





The safe/setup beam at 7 TeV



After LS1 the LHC will be operated at an energy close to 7 TeV. The value of the normal *setup* beam flag would in this case allow an intensity of $\sim 1 \times 10^{10}$ (**pilot beam**)

PLUS THE ε FACTOR	4 Tev		7 TeV (maintaining the curves)		7 TeV (maintaining the concept)	
	Allowed intensity	Factor (wrt normal)	Allowed intensity	Factor (wrt normal)	Allowed intensity	Factor (wrt normal)
NORMAL	2.5×10^{10}		1×10^{10} p		1×10^{10} p	
RELAXED	1.2×10^{11}	5	4.8×10^{10} p	5	1.2×10^{11} p	13
VERY RELAXED	3.26×10^{11}	13	1.26×10^{11} p	13	3.26×10^{11} p	34

We must review the concept and limits for relaxed and very relaxed safe beam flag ↔ commissioning and MD needs and risks !

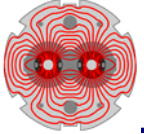


Operation

New ways to operate the LHC:

- Combined ramp&squeeze,
- Beta* leveling,
- Lower beta* at injection,
- ...

will have to be looked at in terms of MP and collimation.



Software tools from MPS

- Ideas and concepts to move the MPS commissioning tracking

from here....

to there !

Machine Protection web site

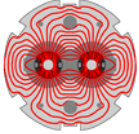
MPS Task List 2012

Test Name	Start Date	End Date	EDMS Document	Contact Person	Results	Locations Tested	Repetition	Status
4TeV pilot	01/01/2012	01/01/2012	896393	Markus Zerlauth	Test has been completed with beam for the two dump septa magnets. Not absolutely required to repeat for all FMCs with beam, dry-test will be used to calculate the detection threshold for remaining circuits.	P16		S - After Shutdown D - Optics Change
Top energy pilot -β* change	01/01/2011	01/01/2011	896393	Jorg Weninger	Done - see test with squeezed beams	All	N - Never	Done
	01/01/2012	01/01/2012	896393	Jorg Weninger	Test done for: RD1.LR5@ 22/03/12 20:58:05.378 RD1.LR1@ 22/03/12 02:42:30.778	P11; P13; P17	P - Periodic	Done

Sharepoint

AccTesting

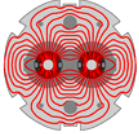
Re-write the commissioning procedures & model in DB !



Summary

- MPS Commissioning:
 - Tracking in Acctestng Framework.
 - Automate! (Step by Step) Candidates?
- Preview: Two new frameworks:
 - Tracking of system dependencies
 - (Test-) Data Analysis
- Early detection of potential problems could be done in by additional trim checks in LSA.
- Aperture Meter: Useful prototype, but needs improvements.

We have to define projects and priorities !

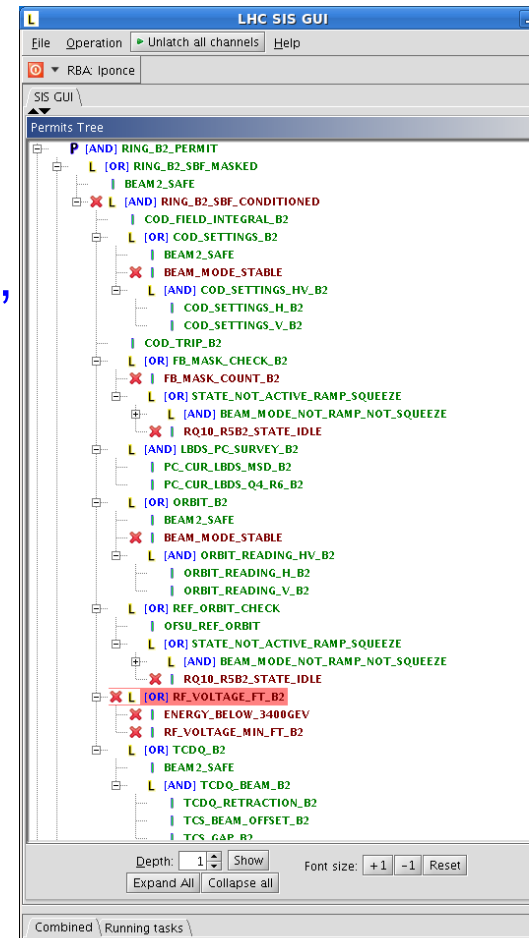


SIS (versus BIS)

- SIS heavily used at LHC, ~2700 subscriptions.
 - Core very reliable, but sensitive to communication errors.
 - Ok for injection interlocking !
 - (Fast) 'Solution' to many problems that were discovered during operation.

- Proposals to improve:

- GUI – trees have become quite complex to read,
- Post-mortem information,
- Parameter / values monitoring,
- Masking,
- Subscription UI.





Changes to SIS

- From SIS to BIS (when? Not right after LS1?):
 - Beam position in TCSG (and TCTs).
 - TDI gap (very old interlock from early 2010 LHC).
- From SIS to Kajetan:
 - All CODs test removed from SIS. Extension to other PCs to be considered.
 - Maintain orbit interlocks.
- From the workshop discussions, expect new interlocks to arrive after LS1.