

R2E Review – November 2011

Please find below a first proposal of review sessions, some names for chairs, secretary, and external reviewers, as well as a list of questions to be addressed during the review. I suggest that the session secretaries:

- **go through the first list of questions and update, add accordingly**
- **then iterate this between the other sessions in order to assure consistency**
- **make a first proposal of talks required for the sessions (including speakers) – see tables**

Suggested Date:

- **week 44: 31.10. – 4.11.**

Key-Questions to be answered (partly provocative):

- How good/bad are our predictions for radiation levels.
- How good/bad are our predictions for equipment failures.
- What failure rate do we expect after 2011/12 xMasBreak and LS1 mitigation actions
- What patch solutions are required to bring us to LS1 and what is the remaining risk
- Radiation tests on power-converters only partly confirm their high sensitivity -> can patch-solutions be sufficient for some of them -> with and without relocation/shielding measures taken for the UJs?
- Do we need betatron collimation in P3 as a backup solution?
- Focusing on the commercial equipment in the shielded areas, what's the status of the tunnel equipment and what will happen when beam-gas kicks in (will it)?
- Are we able to implement all measures for the LS1 shutdown and what are the corresponding preparation and coordination requirements.
- Can we exclude major civil-engineering actions and what activities do remain (and what others impact only the upgrade)?
- What's about the (long) story of safe-rooms and what part is related to R2E.
- How much will it finally cost?
- ...

Draft Agenda

Sessions:

1. **Introduction: Aim of the review + Performed Actions**
chair: M. Brugger
secretary:
2. **Calculations & Monitoring**
chair: M. Calviani
secretary: K. Roed
3. **Radiation Testing, Equipment Failures & R2E Policy**
chair: G. Spiezia
secretary: J. Mekki
4. **Integration & Implementations**
chair: A.L. Perrot
secretary:
5. **Power-Converter Radiation Tolerant Development**
chair: Y. Thurel
secretary:
6. **Planning & Safety Constraints**
chair: K. Foraz?
secretary: S. Roesler?
7. **Alternative Solutions, Resources & Strategy**
chair: R. Losito
secretary: M. Brugger

Details:

Introduction: Aim of the review + Performed Actions

- expectations from operation and the management (Mike or Steve)
- what general questions have to be answered for R2E (Markus)
 - o what improvements are already implemented in the LHC and how much did we gain (important for failure study)
 - o xMasBreak 2011/12 what do/can we do and what's the impact on 2012 Operation
 - o next xMasBreak + Long-Shutdown 1
 - o strategy beyond

Title	Speaker	Key Words	Length
Expectations from operation and the management	M. Lamont or S. Myers	Performance reach, acceptable downtime and SEE impact,	15min
Achieved R2E improvements (mitigation measures)	A.L. Perrot or M. Brugger	Summary of implemented mitigation measures	20min
Key questions to be answered by this review	M. Brugger	Open issues, question-marks and decision criteria	15min

Session – 1: Calculations & Monitoring

(secretary, chairs + reviewer candidates: M. Calviani, A. Ferrari, ESA, + ?)

- LHC Operation: past and future operation (luminosity, loss distribution).
- Vacuum & Beam-Gas: measured densities and predictions for the coming years and how does it compare with calculated monitor predictions?
- Overview/results of additional FLUKA calculations.
- Calibration improvements and summary of calibration values (including references/reports).
- How does the monitored radiation levels compare to the predictions and extrapolations?
- Overview of LHC radiation levels and extrapolation.
- UX15/UL leakage: analysis and outlook
- How 'performing' is the installed shielding (measurements + calculations)
- Is the monitoring coverage sufficient and what long-term developments are required?
- How much are we affected by thermal neutrons?
- How big are our uncertainties in predicting radiation levels (tunnel, shielded areas)
- Radiation levels in the UA63/67 (kicker equipment)
- Are there additional weak-points coming up (e.g., P4, REs)
- ...

Title	Speaker	Key Words	Length

Session – 2: Radiation Testing, Equipment Failures & R2E Policy

(secretary, chairs + reviewer candidates: G. Spiezia, J. Christiansen, F. Faccio, R. Gaillard, ESA, Montpellier, TRAD?, + ?)

- H4IRRAD the new test area.
- PSIRRAD the next step (could also go into calculations)?
- Availability of test facilities/areas (including long-term view).
- Summary of CNRAD test results and lessons learned – impact on LHC (test reports!)?
- Summary of PSI test results (including setups) and lessons learned – impact on LHC (test reports!)?
- Overview and analysis of 2010/2011 equipment failures, including table on performed/envisaged mitigation measures
- LHC/OP impact of SEE induced failures – can we quantify the time?
- How representative is our test strategy (PSI, CNRAD + H4IRRAD) for LHC conditions (shielded areas/tunnel)?
- What can we say about the observed uFIP failures, the expected failure cross-section and the need for mitigation actions?
- Final analysis of QPS failures, extrapolation with LHC operation (especially higher beam-gas densities) and review of applied mitigation plan.
- H4IRRAD radiation tests & consequences:
 - o power-converters
 - o safe-room equipment

- GTO test results and consequences for UA63/67 installation
- other tests
- 1st results and approach of outsourced radiation tests (TRAD or similar)
- nanoFIP status and implementation in user systems
- Other radiation tolerant developments/requirements for the LHC tunnel (present/upcoming)
- What about 'hidden failures': e.g., second stage problems caused from one equipment to the other (e.g., Ethernet switches)
- What about failures possibly attributed to SEE while being of other origin?
- ...

Title	Speaker	Key Words	Length
Environment and test facilities	K. Roed	peculiarity of radiation field, quantities, test facilities	20'
Test strategy	G. Spiezia	Time constraints, facilities, test methods and requirements	20'
Radiation test results: PSI	P. Perronard	Summary of results and impact on mitigation actions	15'
Radiation test results: CNRAD	J. Mekki		15'
Radiation test results: H4IRRAD	tbd		15'
uFIP	J. Palluel		15'
nanoFIP	E. Gousiou		15'
Summary of Equipment failures	G. Spiezia		20'

Session – 3: Integration & Implementations

(secretary, chairs + reviewer candidates: A.L. Perrot, Y. Muttoni, S. Baird, + ext.?)

- Mitigation actions already implemented in the past year and their effectiveness -> covered in Session-1.
- Safe-Room relocations: final strategy
- PAD/MAD: final mitigation approach.
- Shielding blocks: purchase status, storage and preparation, readiness for installation
- Relocation actions per point/area: overview/preparation/planning/documentation.
 - UJ14/16/56/76 and US85
- Shielding actions per point/area: overview/preparation/planning/documentation.
 - UJ14/16/56?, RR13/17/53/57 and US85
- What can/will be anticipated in the xMasBreaks/technical stops?
- Civil engineering requirements (for mid- and long-term actions), what actions come next?
- UJ23/87: long-term requirements/options?
- Analysis of most critical mitigation actions with respect to timing/accuracy/safety (overlap with safety session).
- Coordination requirements for xMasBreak and later LS1

- P4 and REs, first ideas in case it turns out to be a long-term issue

Title	Speaker	Key Words	Length

Session – 4: Power-Converter Radiation Tolerant Development

(secretary, chairs + reviewer candidates: Y. Thurel, G. Spiezia, R. Gaillard, ESA, Montpellier, + ?)

- observed failures during operation, H4IRRAD test results and respective outlook for next years of LHC operation
- status of conceptual design study of radiation tolerant power-converters
- status of conceptual design study of new FGCs
- 60A anything to worry about?
- FGCs anything to worry about?
- component requirements and status with respect to ongoing/planned radiation tests
- strategy of component purchase, availabilities and storage
- is the development/testing/prototyping/procurement strategy feasible and in line with LHC operation
- short-term patch-solutions versus long-term development

Title	Speaker	Key Words	Length

Session – 5: Planning & Safety Constraints (& Policy?)

(secretary, chairs + reviewer candidates: C. Jach, S. Roesler, J. Pedersen, M. Tavlet, T. Wijnands, + ?)

- Relocation actions: possible safety constraints and respective mitigation.
- Shielding actions: possible safety constraints and respective mitigation.
- Foreseen worksite planning and coordination.
- Radiation protection and radiation safety constraints for both, proposed mitigation solutions, as well as final work implementation
- Planning of mitigation actions (xMasBreaks 11/12 and 12/13 + LS1)
- Organization of work-sites and safety responsibilities.
- Status of ECRs and safety documentation (certain overlap with session 3)
- *Requirements for an efficient R2E policy -> possibly not needed for this review.*
- *Strategy/Proposal to implement an LHC (later also for other accelerators) radiation policy.*

Title	Speaker	Key Words	Length

Session – 6: Alternative Solutions, Resources & Strategy

(secretary, chairs + reviewer candidates: K. Foraz, R. Saban, M. Brugger, + ?)

- Status and outlook for new horizontal/vertical superconducting links.

- Betatron cleaning in IR3: a long-term possibility and is it effective for IR7 R2E issues (still needed?)? -> possibly obsolete after coll-review
- Are our radiation test resources sufficient?
- How do we fit the actions into the LHC operation planning and what are our flexibilities in case the planning changes (plan-B)?
- Resource (budget & man-power) status per work-package, update of next year's planning
- Activities/Resources overlaps during xMasBreaks and Long-Shutdowns, what is/can be done?
- Putting it together: input from radiation tests, LHC observations, mitigation actions -> what is the proposed/updated strategy?
-
-

Title	Speaker	Key Words	Length