R2E Mitigation Project Status & Notes

1st R2E Mitigation Project Meeting

Project Meetings

Scheduled on a monthly basis, inbetween direct follow-ups and dedicated meetings (restricted subjet)

Agenda:

- R2E project news and priorities (Markus)
- main work-package reports/status/requirements (5min each):
  - Integration/Implementation (Anne-Laure)
  - PC-R&D (Yves)
  - Monitoring & Calculations (Marco)
  - Radiation Tests (Giovanni)
  - Civil Engineering (John)
  - Safety (Cezary, Stefan)
  - Project support (Sylvain)
- R2E relevant news from OP (Mirko)
- Special issue (defined for each meeting)
- Documentation and planning requirements (all)

Project Team Members

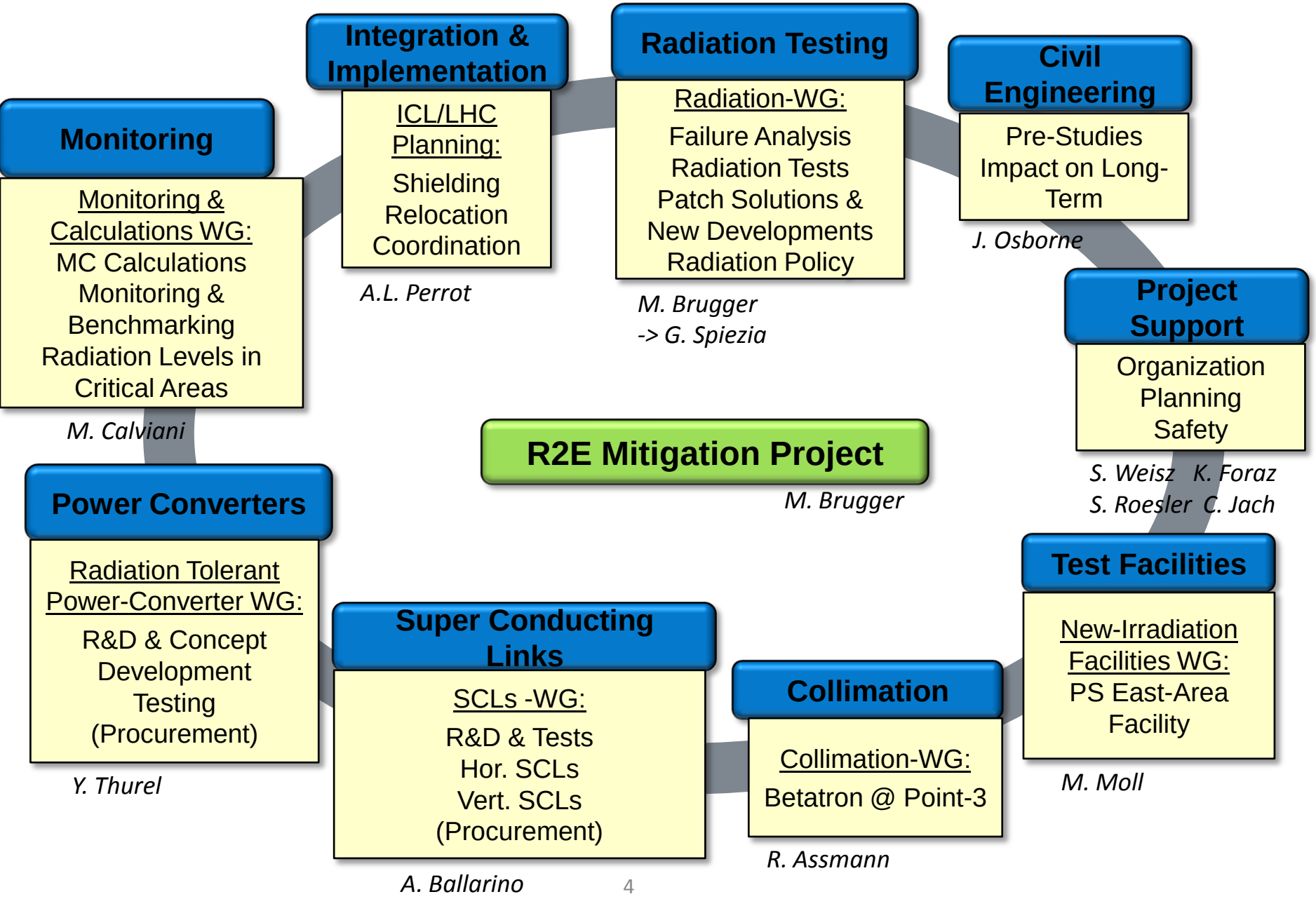
- Project Leader: M. Brugger
- Integration & Implementation: A.L. Perrot
- Power-Converters: Y. Thurel
- Monitoring & Calculations: M. Calviani
- General Safety: C. Jach
- Radiation Protection: S. Roesler
- Civil Engineering: J. Osborne
- Operation: M. Pojer
- Radiation Working Group: G. Spiezia
- Project Support: S. Weisz
- Project Assistant: L. Lari

Work-Packages
+ Main Responsibilities

- Collimation: R. Assmann
- Super-Conducting Links: A. Ballarino
- New Irradiation Facility: M. Moll

Linked Activities

R2E Mitigation Project: Structure



R2E Mitigation Project Work-Packages

(1) Integration and Implementation (A.L. Perrot):

- integration study of long-term mitigation actions (shielding, relocation)
- detailed documentation of all phases (project notes, ECRs, etc.)
- shielding purchase, preparation and storage
- coordination and implementation of mitigation actions (shielding, relocation)

(2) Power-Converter R&D (Y. Thurel):

- conceptual study of radiation tolerant power-converters
- qualification of critical components and cards (standard components followed by WP3)
- prototype development and testing
- procurement according to project decision (linked to WP8)

(3) Civil Engineering (J. Osborne):

- relocation requirements, civil engineering pre-studies in order to keep the long-term mitigation option as possibility (within planning constraints)
- procurement of long-term solution option as a function of WP8

R2E Mitigation Project Work-Packages

The following two work-packages are clear deliverables for the R2E mitigation project. These activities are (one) part of the mandate of the related working groups (RadWG, MCWG)

(4) Radiation Testing & Equipment Group Support (G. Spiezia):

- radiation tests and respective support to equipment groups (CNRAD, H4IRRAD, external facilities)
- radiation testing of standard components of WP2 and support for other tests
- analysis of observed LHC failures of electronics
- development of patch-solutions

(5) Monitoring and Calculations (M. Calviani):

- R2E related Monte-Carlo calculations
- review of monitoring, respective tools and reporting
- benchmark measurements and campaigns
- reporting of radiation levels to equipment groups (through RadWG)

R2E Mitigation Project Work-Packages

linked work-packages (part of other project, outcome important for R2E):

(6) Super Conducting Links R&D (A. Ballarino):

- not budgeted within the R2E project, covered through and followed by HLHC project
- technical development of SCLs (horizontal/vertical) required as possible long-term solution for R2E
- option for long-term mitigation covered by WP8

(7) Betatron Collimation at IR3 (R. Assmann):

- not budgeted within the R2E project, covered through and followed by collimation upgrade project
- installation of additional collimators to allow for betatron cleaning in IR3
- study of long-term impact/possibility for IR7 collimation
- option for long-term mitigation option covered by WP8

procurement of long-term solution (result of R&D and analysis phase one):

(8) Long-Term Solution (M. Brugger):

- based on results of other work packages and linked activities: final proposal of long-term solution
- optimization in terms of risk/cost and implementation within shutdown constraints
- reserve and assurance of long-term procurement options as listed above
- PS-East-Area upgrade study for long-term radiation test area and possible implementation

Budget Codes

Description	Code	Budget Holder Sign. Limit 10kCHF	Related Activities
R2E-General	55271	M. Brugger	Project support, civil engineering pre-studies
R2E-Shielding	55273	A.L. Perrot	purchase of shielding blocks, preparation, design, installation
R2E-Relocation	55274	A.L. Perrot	cabling, additional racks and equipment, relocation preparation & work
R2E-Monitoring	55275	M. Calviani	additional monitors, calibration measurements, calculation support
R2E-FGClite	99690	Y. Thurel	part of workpackage for radaition tolerant power converter FGClite development, contact Q. King
R2E-Rad-DIM	99691	Y. Thurel	part of workpackage for radaition tolerant power converter DIM development, contact Q. King
R2E-LHC120A-10V Rad-Tol	99692	Y. Thurel	part of workpackage for radaition tolerant power converter development of 120A converter, contact Y. Thurel
R2E-LH600A-10V Rad-Tol	99693	Y. Thurel	part of workpackage for radaition tolerant power converter development of 600A converter, contact tbd (meantime Y. Thurel)
R2E-LHC4-6-8kA-08V Rad-Tol	99694	Y. Thurel	part of workpackage for radaition tolerant power converter development of 4/6/8kA converter, contact tbd (meantime Y. Thurel)
R2E-Rad-Tol Analogue Studies	99695	Y. Thurel	part of workpackage for radaition tolerant power converter radiation studies and general development, contact J. De Freitas
R2E-Radiation-Testing	55276	G. Spiezia	radiation test campaigns, facility operation (CNRAD, H4IRRAD), test support
R2E-Long-Term-Mitigation	55277	M. Brugger	procurrement of either solution or mixture: RTPC, SCL, CE
R2E-Facilities	55278	M. Calviani	new irradiation facilities

Budget Codes

Description	Code	Group	Group Leader	Budget Holder				
				Sign. Limit				
				10kCHF	10kCHF	10kCHF	> 10 kCHF	> 10 kCHF
R2E-General	55271	EN/STI	R. Losito	M. Brugger	R. Losito	A. Ferrari	M. Brugger	S. Prodon
R2E-Shielding	55273	EN/MEF	S. Baird	A.L. Perrot	S. Baird	I. Efthymiopoulos	M. Brugger	S. Prodon
R2E-Relocation	55274	EN/MEF	S. Baird	A.L. Perrot	S. Baird	I. Efthymiopoulos	M. Brugger	S. Prodon
R2E-Monitoring	55275	EN/STI	R. Losito	M. Calviani	R. Losito	A. Ferrari	M. Brugger	S. Prodon
R2E-FGClite	99690	TE/EPC	J.P. Burnet	Y. Thurel	R. Losito	J.P. Burnet	M. Brugger	D. Duret
R2E-Rad-DIM	99691	TE/EPC	J.P. Burnet	Y. Thurel	R. Losito	J.P. Burnet	M. Brugger	D. Duret
R2E-LHC120A-10V Rad-Tol	99692	TE/EPC	J.P. Burnet	Y. Thurel	R. Losito	J.P. Burnet	M. Brugger	D. Duret
R2E-LH600A-10V Rad-Tol	99693	TE/EPC	J.P. Burnet	Y. Thurel	R. Losito	J.P. Burnet	M. Brugger	D. Duret
R2E-LHC4-6-8kA-08V Rad-Tol	99694	TE/EPC	J.P. Burnet	Y. Thurel	R. Losito	J.P. Burnet	M. Brugger	D. Duret
R2E-Rad-Tol Analogue Studies	99695	TE/EPC	J.P. Burnet	Y. Thurel	R. Losito	J.P. Burnet	M. Brugger	D. Duret
R2E-Radiation-Testing	55276	EN/STI	R. Losito	G. Spiezia	R. Losito	A. Ferrari	M. Brugger	S. Prodon
R2E-Long-Term-Mitigation	55277	EN/STI	R. Losito	M. Brugger	R. Losito	A. Ferrari	M. Brugger	S. Prodon
R2E-Facilities	55278	EN/STI	R. Losito	M. Calviani	R. Losito	A. Ferrari	M. Brugger	S. Prodon

Project General

- Work-Packages defined
- Budget Codes available
- DPOs ok (EN/TE/GS)
- Budget update requested prior to Chamonix (requiring input from various work packages)
- Fellows: TE/EPC, EN/STI, ½ EN/SEM
- Marie-Curie: Roberto's call for 'Functional Safety' -> quite good response for R2E related proposals -> quite some work ahead before January 26th

Some News

- **SafeRooms**:
  - follow-up by DG/SEE, input provided by EN/MEF
  - Discussion with EN/EL -> under study, input to be prepared for DG/SEE
  - next step: risk of fire (DG/SEE), feasibility (EN/EL)
- **Marie-Curie Network**:
  - Currently trying to get a proposal into the next call
  - Impact for R2E: several projects possible for radiation tolerant developments (PCs, QPS, Interlock,…), facility design (east-area) and related collaborations (TRAD, University of Montpellier)
  - Quite tight time-line, but we'll try
- **University of Montpellier**:
  - Already independently from MC agreement for collaboration (yesterday's visit)

Some News

- Ion operation revealed **weak-points in DS/ARC of P7** (8:30h and LMC discussions)
- Preliminary radiation field **analysis is coherent with FLUKA predictions** (strong analysis of monitoring is key issue) -> MCWG
- Failure observations **lack statistics/events** -> further check through RadWG
- **P5 Baseline** -> see draft memorandum
- **Chamonix**, two presentations:
  - "R2E relocation and shielding activities" (planning session)
  - "R2E Reality or Fata Morgana" (Ralph's session)
- **Project/R2E structure** -> "in operation" -> official approval pending

Chamonix Abstract (I)

R2E relocation and shielding activities

The level of flux of hadrons with energy in the multi MeV range expected from the collimation system at Point 7 and from the collisions at the interaction Points 1, 5 and 8 will induce Single Event Errors (SEE) of the standard electronics present in equipment located around these Points. Such events would perturb the LHC operation. As a consequence, the sensitive equipment will be shielded or relocated in safer areas.

Relocation campaigns will be performed during the next long shutdown in Points 1, 5, 7 and 8. In parallel, shielding walls will be installed around Points 1, 5 and 8. About 15 groups (including equipment owners) will be involved in these R2E activities with work periods from few days to several months.

Delaying all these activities by one year may have an impact on the LHC operation depending on the LHC beam conditions during this additional running year.

Chamonix Abstract (II)

Radiation to Electronics: Reality or Fata Morgana?

A first year of successful LHC operation has passed reaching about 50pb^{-1} of integrated luminosity (1‰ of nominal, 5% of 1fb^{-1}) and more than 1% of peak luminosity, as well as a successful ion run. It's thus time having a first look on the observed radiation levels around LHC critical areas and to compare them to available simulation results. In spite of the still very low integrated intensities and cumulative luminosities, we will try revisiting the failure rate predictions by looking at both the observed early failures, as well as the additional results from 2010 CNRAD tests. Upcoming possibly in early 2011, electron cloud and scrubbing issues and their impact on radiation levels will also be briefly discussed. Updated predictions for 2011 operation and beyond will be deduced, on the base of the envisaged LHC intensity, energy and luminosity reach. Starting from these estimates, priorities for short-term improvements and beam tests are discussed, as well as a brief overview of upcoming R2E driven mitigation actions.

Linked Activities

- **SCLs**:
  - R&D started intensively
  - Test-stand should be available as foreseen (rather earlier)
- **Collimation**:
  - IR7/3 in baseline
  - Cryo-collimation will be important for ion-operation (recent failures in DS up to ARC!)
- **New Facilities**:
  - PS East-Area renovation could foresee irradiation area
  - In contact with M. Moll to see for specifications
  - DIRAC approved for 2011, stop likely afterwards
  - mixed facility would be logical next step (after CNRAD and H4Irrad)

Next Priorities (complete?)

- **Integration & Implementation [Anne-Laure]**
  - xMasBreak actions
  - Point-1 what do we do
  - ECRs, ECRs, ECRs
  - How long can we keep the option open for the P5 shielding (linked to safe-room)
- **PC R&D [Yves, Giovanni]**
  - Planning for first radiation tests & definitions
    (radiation effects course next week)
- **MCWG [Marco, Markus]**
  - RadMon relocations
  - Comparison of early measurements with simulations
  - Radiation levels around critical areas (protons, ions, scrubbing)
- **RadWG [Giovanni, Markus]**
  - Review of failures, did we miss something?
- **CE [John, Anne-Laure]**
  - P5 activities
- **DG/PRJ, DG/SEE, EN/EL, DGS/RP [Sylvain, Cezary, EL, Stefan]**
  - push for safe-rooms (we're on the way)
  - fire studies
  - memorandum P5 (see link), email from Anne-Laure yesterday
- **Operation [Mirko]**
  - summary of 2010 operation (intensities dumped, injected, efficiency)
  - failures in critical areas (did we miss something?)
  - foreseen for 2011 (and beyond) … in view of Chamonix (retour Evian)
- **Project [Markus, All]**
  - Budget & planning update required -> please review your requirements