Minutes of RADWG meeting held on 12 March 2009

Presence: Daniel Kramer EN/STI, This Wijnands EN/STI, Stefan Roesler DG/SCR, Julian Palluel BE/CO, Jonathan Emery BE/BI, David McFarlane EN/MEF, Olaf Van Der Vasser IT/CS, Bruno Puccio TE/MPE, Rainer Denz TE/MPE, Andreas Herty BE/ABP, Roberto Losito EN/STI, Alfredo.Ferrari EN/STI, Yves Thurel TE/EPC, Eva Calvo BE/BI, Erik Van Der Bij EN/HDO,

Introduction (**T. Wijnands**): This year's CNGS radiation tests devoted as usual to "as installed in LHC" complete system irradiations. Tests outside of CERN are planned in parallel (see page 3).

Radiation issues management (**R. Losito**): *LMC (LHC Machine Committee) chaired by S. Mayers has to take the decisions and eventually commit the resources. R2E (radiation to electronics) proposes solutions, provides radiation simulation and measurement data. It also provides guidelines for radiation tolerance for the concerned locations and for radiation tests. In future, it should provide a coherent radiation tolerance policy for new electronics to be installed in the LHC underground areas. RADWG is steering the radiation tests of equipment and collects the equipment details. RADWG reports to R2E and R2E to LMC. When someone needs to know radiation levels in some LHC area, please look at the R2E website documentation (CERN wide access). R2E makes iterations over all the LHC points to survey the installed electronics equipment and propose future actions if necessary resulting in a report for each IP. So far IP7 (UJ76) and IP8 (US/UX85) were treated, IP5 will be iterated soon.*

Statement of priorities: Tunnel electronics is critical for the machine operation and will see the highest radiation first. ***Therefore tunnel electronics have the highest priority*** together with UJ76 (radiation from the collimation). When collisions are established, other areas will follow (US85 was already iterated, so UJ56 together with UJ14 and UJ16 are the next highest priorities – respective simulation data will be made public). The design of equipment should still be done taking into account the nominal LHC parameters. Hard SEE should be strictly avoided (permanent damage).

R.Losito: *We expect that the run 2009/10 should not be catastrophic from the point of view of SEE (single event effects), but we will be certainly "on the limit". In UJ56 you may perhaps see some errors when we collide.*

Each equipment group is responsible for the radiation tolerance of its electronics and when someone finds it necessary to relocate the equipment into another area, please bring your request to the RADWG or eventually send a responsible person to R2E to discuss it.

CNGS RP issues: The storing of activated equipment inside the access room is no more possible. It has to be transported like any other radioactive waste for cool down. More details will be provided in 2 weeks by Luisa Ulrici. A specific training will be put in place by Heinz Vincke and everybody accessing the CNGS side gallery will be requested to pass the training. More details also in 2 weeks. Users are also asked to minimize the amount of radioactive waste produced. For example the cables form last year can be reused, as well as possibly a single VME crate could be reused consecutively by several users. Details of the available equipment will be provided on the dedicated webpage (under construction). The traceability of the equipment should be put in place for the tests, but it was not yet decided how.

Access to CNGS test facility : Only CERN staff is allowed to access the area. The number of people accessing the gallery has to be strictly minimized.

R.Losito: *In future, if the equipment owner can not show any prove of radiation tests, the installation in the tunnel (in the areas of concern) will not be allowed for the new electronics.*

Manipulation of activated electronics: All groups (CERN-wide) should have a common lab space available in a one building, where radioactive electronic components could be manipulated. Doris Forkel-Wirth is working on the project.

For the moment, it is necessary to wait for cool down and then ask for spectrometric measurements to RP. Further permit depend on the nature of operations foreseen (testing, soldering, drilling etc…). S.Roesler: If no components are removed, perhaps an analysis in the lab could be allowed. Tracing is then very important. More details should be provided by RP in the next meeting.

E.Calvo: *When something fails, a very complex setup has to be used for analysis of the electronics. It would very expensive and difficult to duplicate such setups in a different place*.

R.Losito: *It is on the responsibility of each group to decide if it needs a dedicated radiation lab*. It is nevertheless strongly recommended to use the radiation lab.

Ilias Efthymiopoulos: *Photos of equipment to be tested are required, as well as a list of responsible people and description of their equipment including the weight. Mechanical supports will be then produced for smaller equipment with a height of 50cm.*

Planning of the CNGS tests:

A dry run (week 17) in the CNGS control room is necessary at least one week before the installation. The installation to CNGS should be in the week 18 (1 full day). It consists of moving the equipment from the control room to the test area, where the same connectivity is present in the test stations. CNGS startup is scheduled for 4 May 2009. (Access is encouraged already now to see the area; EDH request is required.)

Several stops are planned for CNGS due to long MDs in the pre-accelerators, thus 7 irradiation periods should be available with possible exchanges of equipment during the stops. As we have 4 stations, there are 28 slots available.

The list of attributed slots is summarized in the following table:

	TSG45 A	**TSG45 B**	**TSG46 A**	**TSG46 B**
1st slot	WorldFIP	BLM/BPM	QPS	CRYOGENICS
2nd slot	WordFIP	BLM/BPM	QPS	CRYOGENICS
3rd slot	WorldFIP	BLM/BPM	QPS	CRYOGENICS
4rd slot	Vacuum	Power Conv	QPS	BIC/PIC
6rd slot	Vacuum	Power Conv	QPS	BIC/PIC
7th slot	Survey	Power Conv	QPS	BIC/PIC

Irradiation rule: Once several slots have been attributed to one user, irradiation can be as long as needed or until the eq. fails. The following person on the list is then notified in order to prepare for the next slot, if no other equipment is to be tested. The available access window is usually 1 to 1.5 days even if the stop is longer.

Recommendation: Try to start in location with a lower dose rate in order to get the required single events (required fluence in 3-4 weeks) rather than failure due to total dose. **M.Brugger**: *On the other hand, if the equipment is placed behind the edge of the duct, the simulations are of little use (gradients, round edges), so the Radmon has to measure on that device*.

Remarks to the slots: World FIP slots are dedicated for the tests of old/new FIP devices, the repeaters and the derive FIP. 7 slots are given to QPS due to its importance. High temperature superconductive (HTS) leads could be eventually tested in parallel profiting of the QPS cards. To be decided if PSI is not better suited.

Expected radiation levels: Based on the 2008 Radmon measurements and the respective simulations, the expected dose, 1MeV eq. neutron fluence and high energy hadron fluence normalized to 10^{18} protons on target (wpot) are summarized in the following table.

From the 2008 run, one can expect 1 to 2 wpots per week. The wall position corresponds to the most distant wall from the target (centered to the TSG duct). The floor ones are the hottest spots in the respective test regions.

RADMON	POSITION	DOSE [Gy/wpot]	1MeV eq n^0 [/cm^2/wpot]	HADRONS>20MeV [/cm^2/wpot]
3LM07S	wall (TSG45)	6.4	8.7E+10	5.6E+10
3LM07S	floor (TSG45)	26.2	2.7E+11	1.9E+11
3LM08S	wall (TSG46)	1.3	1.6E+10	9.1E+09
3LM08S	floor (TSG46)	2.4	2.4E+10	1.8E+10

Contact persons:

Jerome Lendaro – technical matters

Heinz Vincke – Radio Protection

Daniel Kramer – radiation measurements

Markus Brugger – Fluka simulations

Thijs Wijnands – coordination of the tests

Other tests foreseen:

CEA Prospero reactor in Dijon – 1MeV neutrons: only one slot available during 11-15 May 2009 for CERN. Neutron test is important for most of the bipolar and optical devices (PIN or laser diodes, optocouplers etc…) as it produces the displacement damage without dose effects. The neutron flux is set by placing the devices to the correct distance from the reactor. So far 3 users are on the list:

- BI,PO; Radmon (with thermal neutrons)

PSI Villigen

- week 13 (60MeV p+): BLM tunnel card with the new mezzanine card; WIC remote module for the Siemens PLC.
- week 14 (250MeV p+): radmon calibration and QPS system; (CV not replied yet)

LIF proton line in UCL (Louvain la Neuve, Belgium)

- week 23 (75MeV p+, up to $10^9\,cm^{-2}s^{-1}$): ODH and Survey

Co-60 total dose tests

- IRA (Lausanne) week 6/8: Radmon calibration
- Pagure CEA Paris (to be scheduled): BLM/BPM cards, Survey

We always try to group the irradiation orders as the cost is then divided between the respective users.

Remarks:

R.Losito: *Irradiation test results should be available publically for other users on the CNGS R2E website. Careful analysis of the data and the components is nevertheless required*.

R.Losito: *Next RADWG meeting has to be scheduled for 26 March*