Minutes of RADWG meeting held on 3 July 2009

Presence: Daniel Kramer EN/STI, Julian Palluel BE/CO, Rainer Denz TE/MPE, Roberto Losito EN/STI, Yves Thurel TE/EPC, Antonio Marin BE/ABP, Giovanni Spiezia EN/STI, Georges Burdet EN/EL, Rodrigo Sierra IT/CS, Evangelia Gousiou TE/CRG, Gonzalo Penacoba TE/CRG.

Matters Arising (**D.Kramer**):

A power cut from 18 June during a no beam period created a transient glitch and influenced the RadMon's (device #7 & #8) hadron SEU counters. Only differential values are therefore meaningful. The question is why it was not filtered by the UPS.

It was also found that the temperature variations during the access were interfering with the annealing compensation algorithm of the dose and 1MeV neutron equivalent fluence measurements. The algorithm was therefore removed from the DAQ.

WorldFIP communication problems were encountered by the CRYO team in CNGS. The gateway exchange did not help and the electrical test was OK as well as the reflectometer test.

The CRYO team decided to move into the high radiation area of TSG45 in order to accelerate the test. WFip cable length is sufficient according to J.Palluel.

BLM report on the ongoing CNGS tests **(E.Effinger)**:

Two 5V power supplies *Haltec-USR515-5A* died both at 30Gy and the respective 1MeV n. eq. fluence of 3e11cm-2. The last power supply of the same brand (*Haltec-USR515S-2A*) delivering 2.5 V is working properly up to now. The dead power supplies were removed on 17 June 09 from CNGS.

The BLM tunnel card had 7522 CRC errors with the energetic hadron fluence of 3.6e11cm-2 (system cross-section of 2.1e-8cm2). All of the errors were correctly handled by the system as expected.

The new mezzanine card exhibited no false reset. The output data from the analog measurement chain have yet to be analyzed.

Report on the uFip events observed in CNGS **(R.Denz)**:

The communication problems are observed in the new QPS layer of the field bus coupler of the type DQAMGS. When a single event occurs inside the MicroFIP or the FIELDRIVE the connection is lost (data no longer updated). A power cycle is necessary via on old uFIP, which is reliable under irradiation.

The cross section for the SEFI is 2.5e-10cm2 (based on 6 events). Assuming the 200 days of LHC operation with beam, the QPS system would be corrupted 20 times per day, which is not acceptable.

Possible solutions (450 devices are still in the lab):

- Option 1: firmware upgrade to detect loss of communication in the field
  - Re-initialization of chip and hard reset of line driver via MicroFip™
  - No modification of field-bus coupler hardware
- Option 2: hard reset of MicroFip™ via microcontroller
  - Minor modification of field-bus coupler hardware
- Option 3: power cycle of MicroFip™ triggered by microcontroller

- More complex but still feasible hardware modification

- Option 1 and 2 to be tested in CNGS

The best solution is of course the accelerated development of a new RadTol uFip anf FieldDrive with the 100% software compatibility.
The current hypothesis is that the interrupt is not transmitted by the FieldDrive, but it is undistinguishable so far.
J.Palluel replied that there were so far no problems observed with the FTR.

Report on the ongoing HTS CL heaters measurements at CNGS **(S. Le Naour)**:

S. Le Naour gave an overview of the measurement results performed in CNGS in 2008 and described the modifications on the setup for 2009 in order to increase the statistics. Every time a solid state relay is controlled by a regulator. One of the regulators was recovered from 2008 as well as the SS relays.
One of the regulators stopped (SEFI) after about 5e9 hadrons/cm-2, while in 2008 a SEFIs occurred after 20e9cm-2 and the destructive event after 9e9cm-2.
308 regulators are installed in the critical areas from the point of view of radiation levels (red code on R2E pages). Another 256 devices are placed in the lower risk areas (orange code). The estimated color codes are more pessimistic, as the foreseen shielding was not approved yet {shielding integration was actually approved in August 09}. When the regulator fails, the beam is not stopped but the ice will start to form and the restart of the beam is impossible until the exchange.
For the CNGS tests, a remote reset remains an option to be installed during the next access using the RS485 cable with a relay.

Architecture and Implementation of the Control & Monitoring System for CMS **(A.Marchioro)**:
A very complete overview of the "I/O" system in CMS was given by Alessandro. Even if the requirements for the experiments are very different from the machine side, the use of the same or similar technology could very well be considered for LHC.
All the ASIC chips use the 0.25um IBM CMOS process qualified by the LHC experiments and all the logic is protected by TMR. In the system, no interface can use more than 2.5V.
The top HW layer is based on the ring topology connected via 2+2 pair of optical fibers with maximum of 255 CCU (communication and control unit) controllers, while the master unit is in a well shielded area in a VME crate.
The system is formed be the following components:

- CCU: redundant units (2 neighboring units must not fail), 1 unit has i.e. 16 I2C interfaces
- CCUM: node controller includes the CCU (up to 20?)
- DCU: monitoring chip with 7 inputs and internal temperature probe; Calibrated output for Pt100, 12bit ADC
- And other auxiliary chips

Most of the chips were produced in quantities > 50k and the price is about 10chf for the CCU and 5chf/pc for other chips.
The SW development took much more time and effort than the HW one!
The efficiency of the production is very high; only 3 chips out of 1.5M were faulty…
The list of the chips developed by PH will be sent later on.

Simulated Radiation levels in IP5 and IP1 **(M.Brugger)**:
The updated simulations of the LHC radiation levels are normalized for 100fb-1 (nominal year of operation). The expected levels for 2009/10 (300fb-1) are written beside the plots. The radiation fields in the 2nd floor of the RRs (the most exposed locations i.e. HTS) are 2 to 3 times higher than the bottom due to the limited shielding height. The main source of radiation in 09/10 period for the RRs should be the beam gas. The shielding for the UL will have to be movable to allow eventual magnet transport and it is impossible to shield the second floor of the UJ56 area.
The simulated levels will be continuously updated on the R2E website: http://cern.ch/r2e

Following the list of priorities (critical areas) integration studies are ongoing.