

Minutes of RADWG meeting held on 24 April 2009

Matters Arising (T. Wijnands): The form for each equipment to be installed to CNGS is available on the CNGS electronics test web site. The filled form has to be sent to Heinz Vincke and Ilias Efthymiopoulos.

The final QPS report has to be provided directly by R.Denz; the one provided by G. Spiezia was only preliminary. As discussed, a template will be prepared for the test reports (Action: D.Kramer).

Database of radiation test results

R.Denz asked about the possible way to make the radiation data available inside CERN. **R.Losito:** *S.Mayers said, we should make a database.* **T.Wijnands:** *The crucial point in making such a database is the quality assurance of the input data. The single component tests are relatively easy, but complex system test results are not generally portable to other applications.* **R.Denz** pointed out that the producers' interaction with the publicly accessible radiation data is rather dangerous. **T.Wijnands:** mentioned that the reports of the recent irradiation campaigns are not accessible from outside CERN and contain a disclaimer "personal view, which doesn't necessarily reflect the opinion of the equipment owner". **R.Losito** concluded that the access to the test results will be restricted and the creation of the radiation test results database will be discussed later.

Recent test beam results (PSI)

R.Denz mentioned the recent very successful tests performed for his project by ETH Zurich in PSI Optis line. The Actel ProAsic and the 16bit ADC tests were encouraging. **R.Denz** also added that attention should be paid to the use of the Traco AC/DC switched mode power supplies (**TML 15105C** and **TMP 30515**), as they were tested in PSI and 2 out of 4 failed at $8e10$ and $1e11$ p+/cm² (wide non-uniform beam conditions => optimistic estimation!). **T.Wijnands:** The DeriveFIP test results from PSI were not very good and modifications should be done to the device. **D.Kramer:** *The RadMon tests performed in PSI provided us with very interesting data, which will be used for the calibration of the detectors.*

Next Irradiation campaign in UCL Belgium

T.Wijnands: Apparently, no more beam time is needed for the tests in June (UCL), as all demands were satisfied. The following equipments should be tested in the next proton beam campaign currently foreseen for 2-5 June 2009:

- Fire detection / ODH
- Cooling and Ventilation
- Survey
- Controllers of Superconductive Current Leads for DFBs – participation NOT yet confirmed

Description of the equipment to be placed in CNGS

QPS (R.Denz)

Devices to be placed under the LHC dipoles. Required hadron ($E > 20\text{MeV}$) fluence is 10^{10} cm⁻² (10y of operation). The DAQ data are logged to Timber.

List of devices to be tested:

- Field-bus coupler type DQAMGS (1x) [Latest MicroFipTM version]
- Field-bus coupler type DQAMS600 [Old MicroFipTM version, test control and DAQ for HTS curr. leads]
- Bus-bar protection system type DQQBS (2x) [verification of firmware upgrade, tested in CNGS in 08]
- Symmetric quench detection system type DQQDS (2x, will be available in 2 weeks) [new card but COTS tested]

previously, contains i.e. Flash FPGA+ ADCs and Amplifiers]

- Power pack prototype unit [low power regulators (tested by PH 2 weeks ago), rectifier bridges]

Flux required: MEDIUM ($1e8/cm^2/day$) then HIGH ($3 \cdot 10^9$ hadrons/ cm^2/day)

Placement: TSG46 - Station 4 [hot spot = $2.6 \cdot 10^9$ cm^{-2}/day]

HTS current leads (R.Denz)

DAQ Support will be provided by the QPS system for the test of the control boards of the current leads. To be installed by **Alain Gharib** from TE-MSC-SCD. Power and control parts were separated, otherwise the same test as last year. It is not supposed to be a critical system from the operational point of view.

Flux required: MEDIUM ($5e7/day$) – to be confirmed

Placement: TSG46 - Station 4

WorldFIP repeater (J.Palluel)

Devices placed in the alcoves of LHC. The 2.5MHz device is the same except of a different transformer. Due to the more difficult cabling at 2.5MHz, only the 1MHz device is tested.

List of DUTs:

- Signal repeater 1MHz for WorldFIP [FieldDrive SSS-B231, Actel Antifuse FPGA -> no MicroFIP]
 - Anti-latch up reset (power cycle), Anti-non repetition reset (Actel), remote power cycle, current measurement, data logging
 - Measurement every 500ms, recording every hour or if thresholds exceeded
 - Data control and logging via FIPDiag (control room)

When soft reset occurs, about 2 cycles are lost.

T.Wijnands pointed out that a precise measurement of the dead times during the soft/hard reset of the FIP repeater has to be performed, so that the users can estimate the impact on their equipment (**Action: J.Palluel**). **R.Denz** said one second of dead time should not be a problem for the QPS system. **Y.Thurel** confirmed the same for the power converters.

Flux>20MeV required: LOW ($1e7/day$)

Placement: TSG45 - Station 1 [under the test station]

CRYO (E.Gousiou)

List of DUTs [Cards for the TUNNEL]:

- CT for Temperature and Pressure
- CL for He level
- CV Valve end-switch digital readout
- CK Electrical Heater for Beam Screen
- MW WorldFIP Communication

- PA Power Supply

These cards contain the following main components:

TESTED previously

- FPGA A54SX72, ACTEL
- ADC ADS7807UB, BURR-BROWN
- DAC AD565A, ANALOG DEVICES
- ASIC R-PBFE, CERN PH-MIC
- OPA627 AU, BURR-BROWN
- OPA541 AM, BURR-BROWN
- Voltage Regulator LHC 4913, CERN PH-MIC
- CC131 (MicroFIP), ALSTOM

UNTESTED by CRG

- DC-DC Conv. TMH0512D, TRACO
 - **R.Denz:** We tested a very similar one and it was very good
- Zenner Diode BZX84A2V4, PHILIPS

List of DUTs [Cards for the alcoves]:

- CY Insulated Temperature for Current Leads
- CH Electrical Heater for Return Module

These cards contain the following main components:

UNTESTED by CRG

- Isolation Amplifier AD210AN, ANALOG DEVICES
 - **R.Denz:** we have tested the component
- Digital Isolators ISO 150, BURR BROWN
 - **R.Denz:** we have tested the component
- DC-DC Converter TEL3-0513, TRACO
- DC-DC Converter TMV0505S, TRACO
- ADC ADS8507B, BURR BROWN
- Solid State Relay RP1A23D6, CARLO GAVAZZI
 - **R.Denz:** we have tested the component and it was very (*to be confirmed*) sensitive to radiation.
 - **E.Gousiou:** the component is necessary for the cards, but it will be located in the alcoves

(Action: **R.Denz** will provide the test results)

Flux>20MeV required: HIGH (3e9/day) [available in front of the duct]

Placement: TSG46 - Station 3

BLM (E.Effinger)

The test rack will contain a ventilator, BLM ionization chamber to generate the signal and a power load for the power supplies. The BLM data will be logged to Timber.

List of DUTs:

- BLM tunnel card x1
 - Includes the new mezzanine card for the remote reset
- Power supply – Arc x1
- Power supply – Straight section RRs x3

Flux required: HIGH (2e10 cm-2/day)

Placement: TSG45 - Station 2

BPM (E.Calvo)

All the possible signals are logged. If the MicroFIP card fails, the BPM cards still work; only the recalibration is not possible any more. Target dose is 400Gy. (During later discussion the dose target was lowered)

List of DUTs:

- WBTN Front End card [contains mostly logic gates] x2
 - Tested in TCC2 in 2001 and in Prospero
- Intensity measurement card
 - Never tested in beam [not a critical component for the 1st years of operation]
 - Might be rather sensitive as indicated by tests of similar cards
- MicroFIP controller [with Actel Antifuse]

Flux required >20MeV: MEDIUM(1e9cm-2/day) then HIGH (2e10 cm-2/day)

Dose rate required: 6.3 Gy/day [calculated as 400Gy in 63days; 3.7 Gy/day = MAX in TSG45]

Placement: TSG45 - Station 2 (on top of BLM rack) [1m from duct edge, than facing the duct]

Installation Schedule CNGS (T.Wijnands):

The installation is foreseen for Wednesday 29 April 9am. Christophe Tromel will organize the access. Jerome Lendaro can help with the technical issues.

E.Effinger: *What is the required length of optical fibers?* **J.Lendaro** replied that about 10m could be enough (to be verified).

R.Losito mentioned that according to the unofficial information, the CNGS beam might not be available until mid June due to the earthquake in the Gran-Sasso area. The experimental installation didn't suffer, but the access to the site is difficult and many people lost their houses, so they have obviously other priorities.

T.Wijnands: It is still valid that every user has to wait for its slot to be freed by the previous user. The agenda will be updated accordingly.

Fluka CNGS radiation levels at RadMon locations (M.Brugger):

Markus gave an overview of the Fluka simulation results for the CNGS area with the focus on the test areas and the test stations. The statistical fluctuations account for an error of ~20-30% and together with the geometrical simplifications one should consider a safety factor of 2-3. Mainly the gradients close to the edges of the ducts are difficult to simulate, therefore the error increases with the distance from the edge. The gradient is more important for the hadron fluence (more directional) than for the dose and the 1MeV eq. neutrons. The simulation data for the test station regions (connections) were added to the summary table below.

Due to the minimum hadron $E > 20\text{MeV}$ fluence levels of $10^6\text{cm}^{-2}/\text{day}$, no radiation sensitive control devices should be placed under the test stations (i.e. PLCs).

T.Wijnands: there will be no supports available for the tests as RP is against it because it produces unnecessary waste. The use of the supports should be re-discussed between RP and Ilias (**Action: I. Efthymiopoulos**).

M.Brugger: In this case, an additional safety factor of 2 should be considered for the simulations due to the effect of the floor flatness and thermal neutrons.

H.Vincke pointed out that last year the HTS current lead devices used a wooden chariot, which should be avoided. Nevertheless, the new installation was modified, so it does not contain any wood.

Operational schedule & startup CNGS (I. Efthymiopoulos):

There is no official news about the startup yet. The beam will be available in the second week of May, but OPERA has to be ready in order to have high intensity beam on the Target. The decision about the start-up planning should be taken in mid-week 20.

Every equipment group has to provide the form (see last minutes) with the pictures of the devices, which has to be approved before the access and circulated.

Apparently too many people have registered for the CNGS access according to Ilias. This is not what was agreed for the test facility.

Concerning the beam intensity for 2009, it should remain at the levels of last year i.e. $\sim 1\text{e}17\text{pot}/\text{day}$.

Reminder of the radiation field levels from 2008 measurements and Fluka* simulations (Values to be expected in ~ 1 week of CNGS operation; **wpot=1e18 protons on target**):

RadMon ID	POSITION	DOSE [Gy/wpot]	1MeV eq n0 [/cm2/wpot]	HADRONS>20MeV [/cm2/wpot]
6	wall	0.85	1.4E+10	1.2E+10
7	wall (TSG45)	6.4	8.7E+10	5.6E+10
7	floor (TSG45)	26.2	2.7E+11	1.9E+11
8	wall (TSG46)	1.3	1.6E+10	9.1E+09
8	floor (TSG46)	2.4	2.4E+10	1.8E+10
7*	Station 1/2	0.2	5E+9	1E+8
8*	Station 3/4	0.1	5E+8	1E+7

Next RADWG meeting: to be announced (Thursday 28May?)