

LHC RF Meeting 10th December 2003

Present: Luca Arnaudon, Olivier Brunner, Andy Butterworth, Edmond Ciapala, Wolfgang Höfle, Trevor Linnecar, Roberto Losito, Joachim Tückmantel, Volker Rödel, Daniel Valuch.

Excused/Absent: Philippe Baudrenghien, Thomas Bohl, Elena Chapochnikova, Eric Montesinos.

Agenda:

- 1) Module 3 status in SM18
- 2) UX45 radiation and LLRF location
- 2) Integration - Follow-up.
- 4) Other news & round table

1) Module 3 status in SM18 (Roberto)

A cabling problem explains the lower fields measured in the cavities during previous tests. This has now been corrected and the measurements are no longer in disagreement with the measured forward power. The reaching of 300 kW on all couplers is therefore no longer in doubt as previously feared. Precision of power measurements is better than 5 %.

Conditioning of cavities was slower than expected (cavities A and C were tried) and He processing was done. The more difficult cavity (C) was nevertheless conditioned up to 7 MV/m just before the cryo plant was switched off for the Christmas break. Leak tests on the couplers will be done next week. Tests will resume in mid-January.

Frequencies before and after power tests remained the same for all cavities, but a helium pressure rise during warm-up has changed the frequency of one cavity by 6 kHz.

2) UX45 radiation and LLRF racks location

i) With an average vacuum level of $1.0\text{E-}9$ around 400 single event errors per year are estimated for LLRF racks situated on the cryo side of UX45. On the klystron side the shielding wall makes this a factor of roughly 10 better. More detailed simulations are needed for this area to help find the best solution. As AB-ATB specialists are busy with other work we should do simulations ourselves, which means obtaining a fast PC and installing Fluka.

(Action: Andy)

ii) The experimenters have done tests on various components and results have been documented. Near the beam MIL standard radiation hard components are used, further away older generation standard types are used. For FPGAs ACTEL fuse types are preferred. For Xilinx parts triple modular redundancy is employed. Often original designs are in non-rad-hard technology and migrated after testing. We should look at the experimenters' data to see what factor of improvement would actually be obtained with these components.

(Action: Andy)

iii) The LLRF system could be separated into its fast analog and slower digital parts, the former with its less radiation sensitive components being close to the beam and the latter with its FPGAs etc. further away. This would involve substantial modifications to the present design.

iv) Any relocation of LLRF racks into the klystron side involves moving further into the transport zone in front of TX46. The actual restrictions - and the reasons for them - need to be clarified with C. Hauviller (EST)

(Action: Volker)

v) Possible solutions – e.g. LLRF racks in TX45 and/or on UX45 wall opposite - should be looked at in terms of cable delays.

(Action: Sylvain, Philippe)

vi) The effect of doubling the thickness of the second shielding wall should be included in the radiation simulations.

(Action: Andy)

3) Integration (Volker)

- **Platforms on UX45 klystron side:** The design work has been suspended till we find the best solution for the LLRF racks. The search for a solution is clearly **URGENT!**
- **Faraday Cage in SR4.** A study of the requirements by Philippe and Thomas is under way.
- **Ventilation doors in RB44/46:** The positions have been fixed

4) Round Table

- **Klystron reception** (Olivier)

The 7th klystron has been power tested. Its transfer characteristics will now be measured.

- **LEP Equipment recuperation.** (Olivier)

Work is continuing on the cleaning of racks and recuperation of parts.

- **ADT** (Wolfgang)

Driver Amplifier: The prototype is now being tested by Thales.

Grid Supplies: Frode and Wolfgang will visit the supplier.

Anode supplies: The tender opening is on 15th January.

Kicker tanks: A new manufacturer has been found by Dubna. They will first make a test chamber. The option of construction at CERN is being kept open.

- **Klystron trip tolerance** (Joachim)

The question as to up to what the intensity a trip of one klystron can be survived has been looked at and Joachim has circulated a note. An ideal vector sum system allowing compensation from the other cavities would still produce a sizable phase jump; the system would be difficult to implement and it would be sensitive. The major problem, in any case however, is that above 0.2 A the 300 kW reflected power limit would be exceeded in the tripped cavity and equipment damage would result. The beam therefore has to be dumped for failure of one klystron above 0.2 A beam intensity. The note should be issued as a project note.

(Action: Joachim)

- **AoB**

Trevor expressed his satisfaction with the results achieved for ACS Module 3.

Next Meeting:

17th December at 09:00 in 864-1-C01

E. Ciapala, 10th December 2003.
(Corrected 15th December 2003).