LHC RF Meeting
5th November 2003

Present: Luca Arnaudon, Olivier Brunner, Andy Butterworth, Edmond Ciapala, Wolfgang Höfle, Eric Montesinos, Trevor Linnecar, Roberto Losito, Volker Rödel, Joachim Tückmantel, Daniel Valuch.
Excused/Absent: Philippe Baudrenghien, Thomas Bohl, Elena Chapochnikova.

Agenda:
1) Integration and review of list of outstanding items
2) SM18 – Module 3 status
3) He valves on SC modules and warm recovery line (Roberto)
4) ADT status
5) Other news & round table

1) Integration

a) General(Volker)

Integration in the tunnel area is to be finalized by 11th November. Claude Ruivet has sent the relevant 3-D integration drawings to everyone concerned (18 persons).

For the tunnel areas, CDD drawings updated with the latest integration information are:

LHCLJ_4U0011 ACS in RUX45 => Plan
LHCLJ_4U0012 ACS in RUX45 => X-Sections
LHCLJ_4U0014 ACS APW ADT ACN in RB44 => Plan
LHCLJ_4U0013 ACS APW ADT ACN in RB44 => X-Sections
LHCLJ_4U0006 ACS APW ADT ACN in RB46 => Plan
LHCLJ_4U0009 ACS APW ADT ACN in RB46 => X-Sections

Everyone requested should make comments, or at least report that they have seen the drawings that concern their equipment. Claude will circulate his list of comments.

(Action: All)

Claude can be contacted if there are difficulties in viewing the 3-D drawings.

A number of above drawings will be available (self service) in 864-1-C12, where the 3-D drawings can also be seen.

b) Review of list of outstanding items:

From the list of follow up actions from previous meetings, those concerning tunnel integration are:

i. ACS Modules and integration in tunnel - Arrangement of equipment & accessories:

- **Routing of antenna and HOMC cables**

No patch panel!! Check that cables can pass and connectors can be verified. **(Action: All)**

- **Patch panel – design, position**

For controls & instrumentation signals only – Prototype being prepared, narrow panel to be mounted along top, just under platform (Luca)

- **Re-orientation of tuner connections for easier access**

Parts designed, (C. Ruivet) prototype will be installed in SM18

- **HOMC - Protecting cover**

Simple covers will be made (C. Ruivet)

- **Space for ventilators - on floor?**

OK, included in integration

- **Mounting of waveguides around cavity:**
  - **Support design,** Done
  - **Alignment requirements, definition of reference points**

Consultation with survey group needed **(Action: Olivier)**

  - **Special equipment, special transport requirements**

C. Ruivet has verified that existing (SM18) equipment can be used

- **Mounting procedures and documentation**

In preparation – **(Action: Olivier & Pablo)**

- **Positioning of WG directional couplers, arc detectors in tunnel**

Couplers will probably be fitted outside the tunnel area

- **Warm recovery line.**

Included in integration diagrams. See proposal from Roberto, below.

ii. Other Integration in UX45 Tunnel Area

- **Ventilation in tunnel**

OK, but TIS approval pending => space for blocks around ducts to be allowed for.

- **Radiation Stoppers (AT-VA)**

To be put in integration drawings, can use LEP sector valve profile **(Action Volker/M. Jimenez AT-VA)**

- **Dust traps (AB-BT)**

To be put in integration drawings **(Action: Joachim, Volker, AB-BT)**

- **Water Layout for ADT**

To follow up **urgently** and put in integration drawings. B. Lambert could help J-F Malo with the design (flows, pipe sections,) and C. Ruivet + S. Girod should do the drawings. **(Action: Wolfgang, J-F Malo et al)**

- **Compressed air and water for ACN**

Water **should also be included** in integration **NOW** as it will be costly to do afterwards. **(Action Eric, Volker)**

- **APW & functional specification**

Estimated volume used in integration drawings, functional spec still needed.

- **Crash barriers** – including ACS

To be put in integration drawings **(Action: Volker)**

- **ADT cable positioning, amplifier re-design** for HV connector arrangement

Will need follow up with Russian collaboration. **(Action: Wolfgang, Trevor)**

- **APW cable positioning**

These should also be put in the integration drawings. A patch panel is probably needed to allow connection of a short length of smaller diameter cable to the PUs.

- **Use of P6 for removal of ACS Modules**

To be followed up.

In addition, a space should be reserved in UX45 to store RUX45 tunnel roof blocks when modules are being removed. **(Action Volker)**

2) Module 3 status & planning (Roberto)

- Module 3 low power frequency measurements are shown below:

Cavity	Freq. before PC mounting.		Freq. after PC mounting		Δf_{Qhi}	Δf_{Qlo}
	(MHz)		Qext=200000	Qext=10000		
	P=1300 mbar	P=1350 mbar	P=1350 mbar	P=1350 mbar		
A	400.697	400.705	400.685	400.659	-19.5	-26
B	400.703	400.711	400.692	400.668	-18.5	-24
C	400.726	400.734	400.715	400.689	-18.5	-26
D	400.718	400.726	400.721	400.694	-4.5	-27

Note: Nominal frequency is 400.789 at 450 GeV

There is roughly 8 kHz for 50 mbar pressure difference for all cavities (without couplers), which fits with the previously measured 150 Hz/mbar. Cavity D shows less frequency change than the others after coupler fitting with the coupler retracted but similar difference with the coupler antenna fully inserted.

Waveguides are being mounted, interlock tests are in progress and power tests may start by the end of the week. Initially the cavities will be conditioned to full field with minimum coupling, then the couplers will be conditioned to higher power. Maximum field interlocks protect the cavity from being over-driven if high power is applied with low coupling.

3) He valves on SC modules and warm recovery line (Roberto)

The stability of the pressure in the He return line 'Header D', shared with all magnets in the sector, is a concern for the ACS modules. Normally the pressure should be below 1.6 bar. Pressures of up to 20 bars are possible in the worst case, although such rises are expected to be slow, giving automatic protection valves time to operate. To provide protection for minor overpressures a safety valve (one per module) will open to the Warm Recovery Line (WRL), at a pressure of around 1.8 bar (exact level to be decided). An insulated flexible line will be used to connect the module to the WRL. Space is allowed for a heating element, near the connection to the WRL, in the (hopefully unlikely) case of repeated opening of this valve during operation. Two other valves will open (at around 2 bar) into the tunnel in the event of serious overpressure, either from the module itself or from unchecked rise in the D-header. There is an inevitable risk, that in the event of a serious fault, helium in the entire sector could exit via these two valves into the RF tunnel. The safety implications should be checked with TIS. **Action (Roberto, Ed)**

4) ADT Status

- **Power Converters - Ug1 & Ug2**: The supplier has been selected (FUG)
- **Power Converters - Anode:** The documents were approved by the specification committee on 30th October. Some details, concerning controls, still have to be finalized. **(Action: Wolfgang, Ed)**
- **ADT Kicker Tanks:** As reported last meeting.
- **Driver amplifiers - F514:** Thales - the mechanical design is well advanced; the power design has to be tested. There are some questions on the controls interface. Use of a CPLD is proposed. A video-conference will take place in November (17th November).
- **LTC:** A presentation of work done to model injection damping was given to the LTC on 29th October.

5) Round Table

- **Radiation in IR4** (Andy)

BDI intend to install luminescent screens in each ring on the other side of the D magnets. These are roughly one metre long, have vacuum around 10E-7 and are presently situated upstream of RF equipment. This will almost certainly produce unacceptable single-event upset rates for electronics in the LLRF racks. Interchanging R1 and R2 screens would avoid this problem; feedback on the feasibility of this still has to be received from BDI group. **(Action Andy)**

- **ACN Cavities (**Roberto)

Cavity 3 cleaning has been successful

- **Power Couplers** (Eric)

Work on the next 2 pairs of couplers is ongoing. There are some delays in reception of parts but not critical yet for the planning.

- **ISR Unstacking** (Olivier)

This will begin in week 46. The question of some return to the group, in compensation for the effort involved, was raised.

- **Water pressure valves for Klystrons & Loads** (Olivier)

The preferred and cheaper solution is to have one valve per klystron. Cost is 9 kCHF per valve.

- **RF Components (Daniel)**

Panels for signal treatment distribution to be mounted in the LL RF racks are being constructed. Second generation devices, such as splitters, filters, couplers now meet or exceed the required specs.

- **EVM (Olivier)**

The Thales klystron contract has been changed such that the 10 % payable at the end is now split into amounts to be added on each klystron delivery. This creates problems for the spares/exploitation budget (95540) overall prevision, as the 10 % was on this budget.

- **LHC Status report** (Volker) This has been completed.

Next Meeting:
Wednesday 12th November 2003 at 09:00 in 864-1-C01
Agenda:
1) Module 3 in SM18
2) Integration - Follow-up.

E. Ciapala, 7th. November 2003.