LHC RF Meeting 8th November 2007

Participants:Luca Arnaudon, Philippe Baudrenghien, Olivier Brunner, Andy Butterworth,
Edmond Ciapala, Wolfgang Höfle, Trevor Linnecar, Pierre Maesen, John Molendijk,
Eric Montesinos, Joachim Tückmantel, Daniel Valuch, Frode Weierud.

Excused: Thomas Bohl.

1. P4 & RF Planning

General P4 planning: Cool-down of sector 4-5 is progressing well. Filling the cavities with liquid remains on schedule to start in week 47. Pre-cooling with gas can start earlier. (See cryo status below)

Test of the access systems for cavity powering in sector 4-5: The test of the access system is now planned for the afternoon of Friday 16^{th} of November. Hardware and software pre-checks will be done earlier in the week.

The situation regarding radio protection has been complicated by two issues 1) the need to have the neighbouring arcs still classified as non-designated zones as personnel from contract firms who do not hold personal dosimeters will continue to work there, and 2) reservations by RP on allowing access to the top platform on the cryo side of UX45. Finally, for the first issue, it has been established by RP that the RAMSES detectors at the zone limits (which cut RF) can be modified to reach down to the 0.5 uSv/hr dose rate limit for a non-designated zone. For the second point, the UX45 cryo side, where it now appears that radiation detectors have not yet been installed, barriers will probably need to be put in place on the stairways to prevent access to the top level. Access for interventions on any equipment on that level will only be via the UX45 RF access system.

We have been reminded by RP that additional access protection needed to be put around certain passages in UX45, e.g. to block access to bunker roofs, cable trays at the side if the cavern and through QRL passages. This work has now been organized.

2. Equipment status in tunnel (RUX 45)

Vacuum in module M2.B2: (*LHC 5-Oceania*). A leak test was done by the vacuum group; this revealed no leaks around the couplers, but showed a leak near a vacuum gauge on a pump assembly. This could be stopped by tightening the flange and the vacuum pressure is now back down to 3 to 4E-9.

Cryo status: Modules in sector 4-5: While the sector cool down is progressing well, there are a number of concerns on progress for testing of equipment for filling and regulating the cavities, all related to instrumentation:

• Warm recovery line: This has not been tested, and this needs to be done before operation. It is now expected to be done next week...

• **D-Line valve and auto-shutting:** An error in cabling was found, even although the operation and auto-closing had been declared tested.

• Valve control and readback: While a basic check on remote operation was done the calibration of setting vs. opening was not done; apparently this calibration is needed for regulation.

NOTE There are similar difficulties for the DFBs..

Sector valves on modules: The pneumatic systems need to be changed before machine operation starts. The vacuum group prefers to do this when the modules are cold. Given the catastrophic risks of vacuum loss with the modules full of helium, the best time to do the work would be **after gas cooling, before filling**. Vacuum pressure in the sectors next to the modules is good.

Waveguide transition pieces: Will need to be put in place before low power tests start.

3. LLRF in Faraday cages:

Cage B: Preparation for conditioning of the sector 4-5 modules: While modules, timing systems and cabling are all in place some work needs to be done:

- **Calibration of antenna signals**, using the SM18 antenna coupling measurements and the RF cable measurements recently done.
- Set up of switch and protection module limit: needs full power to be done before removing W/G shorts.
- Check vacuum gauge signals are connecting to their correct cavity controller!
- Check tuner/coupler operation on all 8 cavities.

(Note: Calibration of forward and reflected powers can be done once modules cold and connected)

Cage B: Feedback installation: The modules have been received but some time will be needed for their test. Test procedures also have to be completed.

Cage A: Patch cables are being prepared. We can use FSU to make missing cables if needed, rather than relying on stores delivery, expected only for end November. (To follow up with Jean-Claude). Completion of the conditioning systems and clocks distribution would allow klystron tests for sector 3-4 cavities to continue, while waiting for feedback modules in the other cage.

4. Klystrons in UX45

Sector 3-4: Powering of the eight klystrons for sector 3-4 has started. Again heater curves will be measured and RF power calibration done.

5. SM18:

LHC21: Filling of the test cavity will be delayed by one week, to accommodate a request by the magnet team for extra time to complete the present tracking test. Operation will start with conditioning of the repaired power coupler. The earliest date for LLRF tests probably moves to beginning December.

6. Aob

4 Operational constraints for ACS cavities:

A potentially situation for the ACS modules is that of high D-line pressure with the modules warm. The recent safety study contained in the "Justification for derogation to fit 1.8 bar pressure release valves", EDMS Doc **880723** in final stages of approval with SC, considers the risk in this case to be fully alleviated by the presence of separate non-return, fail-safe pressure triggered valves. However in initial operation, before these valves and their operation have been fully tested, this risk situation must be avoided.

Hence we must ensure that NO POWERING TESTS are done with the modules warm, i.e. the cavities must be filled before the power testing is started. We will remind the cryo, hardware commissioning and operation teams of this by sending a memo. (Action: Ed)

4 Management of RF tests: At any given time the management of the RF tests, including responsibility for zone opening closing and search procedures will be by one designated person, initially either Ed or Olivier, alternating probably on a weekly basis. The name of the responsible person will be noted in the CCC and communicated to all concerned parties.

Next Meeting: To be announced.

E. Ciapala, 8th November 2007.