LHC RF Meeting

31st May 2007

Participants: Luca Arnaudon, Philippe Baudrenghien, Olivier Brunner, Edmond Ciapala, Pierre Maesen, Wolfgang Höfle, Trevor Linnecar, Eric Montesinos, Elena Shaposhnikova, Joachim Tückmantel, Daniel Valuch.

1. P4 RF Installation/Commissioning

- **General planning:** Cool down of Sector 4-5 is planned to start in week 26. It will take a further 5 weeks to get to the point (20K) at which cooling of the modules could start. A recent planning proposal currently under study and presented at the last ICC meeting (25th May) brings the cool-down of sector 3-4 forward to this Autumn. Once cooled down, (end July) sector 4-5 would be warmed up to do the cryo interconnection of sectors 3-5 and 4-5. The two sectors would then be cooled down together, from September, with powering and RF tests done on both sides, lasting till the end of the November. The sector test is still planned, but using one sector only. If at all possible, we would try to do low power tests on sector 4-5 in the first cool-down, (July) and any other tests that might be fitted in.

- **Commissioning planning:** Excel sheets detailing the hardware commissioning planning will be put in the AB-RF server, and kept up to date, at the following location:
http://dfs.cern.ch/dfs/Departments/AB/Groups/RF/Machines/LHC/HWCommissioning
The directory currently contains the latest version for ACS. ADT needs to be added, using input from Eric/Wolfgang. (The file is read-only for the moment. Send corrections and additions to E. Ciapala or O. Brunner). Once nearly finalized this can be put in MTF. (To check with R. Saban's team)

- **Water cooling:** The water flow has now been stabilized on both sides, by adjusting the control settings of the valve that introduces the cold water into the circuit.

- **False floors in rack areas:** We still need to complete the installation of the copper earth sheet on the UX45 floor and put the supporting frame and false floors in place to protect the sheeting. This will be done as soon as reasonably possible depending on material and FSU support.

- **ACS in UX45/RUX 45:**

  - **Pressure test on ACS modules**: Pressure tests on all four modules were successfully done at 2.1 bar in the evening of 24th May. One 2.2 bar release valve was put on each module for the tests. The He circuits and tanks were taken slowly to 2.1 bar and held for approximately one hour. The systems pressurized were the He tanks themselves, the QRL extensions and the flexibles connecting to the modules and part of the warm recovery line. Connection of the WRL flexibles was found to be too difficult, short extensions to the pipes will probably need to be welded. Minor leaks on the pressure sensors in UX45 were cured by tightening the connections on the capillary lines. Valves and rupture discs will now be fitted. The 3-way valves for commutation to 1.5 bar release valve (one per module) during initial cool-down have been ordered.
  - **Cryo commissioning**: The detailed test procedures for the first cool-down urgently need to be established. We will make a list of the tests which we see as necessary (sensors, valve control, signal transfer, interlocks) and simulations of process control functionality, and discuss with AT-ACR. Note that the AT-ACR person responsible for P4 is Udo Wagner. However L. Serio and A. Suraci are main contacts on technical issues.
  - **Power commissioning:** No RF work is being done this week at TS-EL are replacing the current transformers.
  - **Arc Detectors:** All cables are now in place.
  - **HOM cable trays:** The final layout has been defined in detail by Daniel and discussed with C. Nicou. The work should be done in week 23/24.
  - **New Thyratron module:** The new version has a fast interlock on maximum voltage. The prototype is ready for test; if successful four will be produced and installed.

- **Klystron collector cooling modification:** A modified arrangement from Thales will be tested here in three weeks. If successful the modification will be done on a first group of four installed klystrons.

ADT

- **Power test and commissioning:** Is now fully complete.
- **Layout and cabling:** The layout is now clearly defined. Some minor control cable changes will be made in UX45.

2. ACS Modules, Couplers and SM18:

Module 4 (Europa): The Cryo system in SM18 is sill not running, due to transfer line problems.

Polar loop tests: The phase loop tests have been successfully completed. Static precision, dynamic response and noise reduction are to the expected values. These are very encouraging results. Work has started on the amplitude loop; the same characteristics will be measured. For the moment a bias resistor on the output amplifier needs to be uprated and the forward gain levels checked.

Cavity 21: Still planned go into the bunker towards the end of June.

3. LLRF:

Series production and testing for ACS in UX45:

- **Clock distribution:** The modifications on the 70 modules and the final testing are progressing well.
- **Tuner RF front end:** 25 modules have been delivered. Philippe will test the first module and the remaining will be tested by FSU.
- **Dual DDS conditioning:** Again 25 have been delivered. FPGA programming by John on a first module was successful and initial tests look promising.
- **Polar Loop and Modulator** – See SM18 tests above
- **NIM clock distribution modules:** These are being checked by Urs.
- **Switch and protection module:** Version 3 has been tested and 10 have been ordered, expected before the end of July.
- **VME crates:** These are all installed in the Faraday cages, with CPU modules and the systems can be configured and tested next week when power is available in the cages.

If testing of all the above continues well, we are reasonably confident that hardware needed for cavity conditioning in sector 4-5 can be in place by the end of July. Some software support will be needed for the module testing.

Sector test readiness:

- **Fibre timing transmission modules:** We expect to have final versions in September
- **Pulse transmission to kickers and dump:** These can then be tested with AB-BT in October (The physicists would also like to have some signals for the sector test..)
- **SPS synchronization work:** The re-phasing interface, modifications to the synthesizer and development of the phase detector are all in progress. We aim to have this ready for SPS MD in Week 35.

ADT LLRF and Loops:

- **Damper loop module:** The 1-T FB variant prototype has now been successfully tested. A problem with reboot after power down however remains to be resolved. Modifications to make the damper version with serial input are well under way and will soon be ready for testing.
- **Transverse position modules** – analog (input processing) and digital (position detection) modules are presently with the design office. The work has been delayed as we have had to put priority

on ACS modules, to be sure of being ready for cooldown. We nevertheless need to progress with damper loop development work and we will ask the design office if they can put additional personnel (having the necessary level of competence) on this work.

- **VME crates:** We should also install and configure the ADT crates needed in the SR4 racks.

GPS and frequency reference in SR4 The outside firm will install the GPS antenna at P4 for the new 10 MHz reference oscillator. The system uses slow thermal compenstation of the oscillator to obtain constant frequency. For now this system will be the reference for LHC and SPS. PS presently uses another local source; eventually the P4 source with its lower noise and better stability will be transmitted to the PS complex.

Next Meeting: Thursday 7th June at 08:45 in the JBA room.

E. Ciapala, 1st June 2007.