LHC RF Meeting 27th September 2007

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

1. P4 & RF Planning

General P4 planning: Cool-down of sector 4-5 is expected to restart in week 41. There is strong pressure to do equipment tests (RF and power converters) before the end of the year. We anticipate that 20 K would be reached by week 44, allowing cool-down of the two Sector 4-5 modules to start then. While the cool-down would normally only take 1-2 days, the first cool-down will certainly take longer as we will have to carefully check all valves, sensors and procedures.

2. RF Work in RUX 45 (Tunnel) Access will therefore remain free till the end of week 40. The status of the three main activities to be done is given below:

Connection of waveguides: The waveguide sections to re-connect the cavities have been taken from the storage tent (Fortunately they had not been lost...) and are being installed now. While the passerelle across the vacuum chambers between the centre modules is not yet in place it has been possible to put the guides in place safely. Installing these is an extremely difficult and delicate job. Nuts and bolts are still needed to properly complete the assembly of the waveguides. The passerelle will be studied with TS and put in place later.

Fitting of Arc Detectors: The fibres will be connected to the arc detectors on the waveguides near the cavities once the waveguide work has been completed.

Installation and test of ADT amplifiers: The final installation of all 16 amplifiers has been successfully completed. Power tests will be defined and started.

3. UX45 work (Olivier):

False floors in the ADT racks enclosure are nearly complete.

RUX45 Roof barriers: The barrier along the cryo side on top of the RUX45 tunnel roof is now being installed. The barrier on the RF side is already in place.

4. Klystrons in UX45

Klystron boiler replacement: The modified boilers for the eight klystrons on the Sector 3-4 side will be delivered by Thales next week.

Heater current tests: Measurements to obtain the optimum heater current for each klystron have been ongoing, under remote control from B864 R A27.

Final measurement of klystron RF cables: The cables for the remaining four klystrons (those driving Module 1.B2) will be measured early next week.

5. LLRF (Philippe, John, Andy)

Preparation for RF testing in UX45: All LLRF plug-in modules needed for conditioning and tuning of all four cavities of Module 1.B2 are in place in their VME crates in Faraday Cage B. The crates are running and responding over the network. All the SMA/SMC patch cables for RF and clock distributions have been put in place for these cavities. The configuration for powering of the klystron using the conditioning DDS as source has been agreed. Software to permit basic operation is being prepared. First tests with power applied to the klystrons will therefore commence early next week.

LLRF module status: Series production and test are progressing well. Twenty 380 MHz PLL modules have just been received and are under test. The 20 clock generators modules onto which they will be fitted will be delivered shortly. The test of the switch and protection modules continues, to obtain the 12 needed in UX45.

6. SM18: (Pierre)

Cryo: The cryo plant has been tested after the recent intervention; it now delivers just over 20 g/s, compared to the 32 g/s nominal. With this relatively small improvement it will still be difficult to do RF and magnet testing simultaneously, especially in view of the high losses in our cryo line. Serge Claudet has asked for immediate and expected long term test requirements from both groups concerned. We can expect that there will probably be a continuous stream of magnets needing re-testing. However in view of the limited time we will have to test in P4 we will certainly need to do LLRF work on the test cavity. We still also need to complete module 4 (Europe). These two activities therefore need to be pushed as high priorities for the LHC.

7. Hall 112 (Eric)

Coupler conditioning: Conditioning of couplers MC131, 134 is nearly completed successfully resumed and has reached 300 kW. We expect another 2-3 weeks of conditioning will be needed. This will complete the set of four modules needed for 'Europe'.

New Couplers: Couplers 135 and 136 have been successfully mounted. However there will be a delay of 2-3 weeks for bakeout, waiting for the vacuum group specialists who are busy elsewhere.

8. Documentation: MTF for HWC and EDMS

MTF for Hardware Commissioning (Pierre)

See <u>LHC RF Meeting 5th April</u> for a summary of the initial presentation on this by Blanca Perea Solano. MTF is based on identified numbered equipment occupying defined numbered 'Slots' or layout positions in LHC. The hardware commissioning MTF is concerned with the testing of equipment.

Following the presentation an updated Excel sheet specification was made of equipment and tasks (jobs) for APW, ADT and ACS hardware commissioning. For ACS there was a re-organization of the hardware commissioning tasks by individual cavity/klystron 'Line' rather that RF modules of 4 cavities each. See files in directory:

http://dfs.cern.ch/dfs/Departments/AB/Groups/RF/Machines/LHC/HWCommissioning

The new layout was put in place in MTF by Blanca's team. In order to view the status of the various systems, access via 'LHC', 'Hardware Commissioning', 'MTF Upload Progress', 'Upload by Slot class', 'Radio Frequency' which leads to a layout synoptic showing ACS, ADT and APW, which can then be selected.

(See, for example, ACS at http://hcc.web.cern.ch/hcc/progress/progress.php?class=ACSCA)

Pierre has recently updated the job status data for ACS and partly for ADT. ADT and APW need to be checked.

There are still a number of things to improve - title, equipment functional names etc. However the most useful feature is to be able to link to the documentation, procedures, results which accompany the commissioning tasks. There is also the important traceability aspect for INB.

Entering of data, including changing status of HWC jobs, is done via: <u>EDMS</u> then 'Global Database', 'MTF' (Login needed) then 'Access Equipment Data' (or search equipment tabs). Enter name data in the resulting Equipment Data window (e.g. HCACS%, where % is a wild card char, HC for Hardware Commissioning). A list appears, then clicking on a piece of equipment marked as *installed* leads to a window showing its Parent Slot (i.e. its present position in the layout). From here the 'Installation and Commissioning' tab leads to the jobs defined for the slot. Clicking on the job ID allows options such as updating status, attaching documents or repeating the job.

Note that the link between equipment and layout slot, needed for INB tracking, can be maintained using MTF.

Scope: The system relies on Slot definitions in the layout database. All 'main' tunnel equipment (RUX45) is in. In addition the large part of the electronics in UX45 - ACS and ADT racks, crates, down to the level of the individual plug-in-modules has now been defined in the layout database (under

Controls). Hence we could enter all test data in HWC MTF down to this level. Any documents, such as descriptions (hard & soft) procedures, results etc can be attached once they have been put in EDMS.

EDMS system for LLRF (Frode)

A directory structure has now been created in EDMS, for the VME RF modules (See Global Database, AB Department, AB/RF Group, LHC Project, LowLevel, Modules. For each of the nearly 30 modules a folder has been created for documents with sub-folders: Specification, Hardware, Firmware and Tests. Files presently in the DFS file system will be uploaded to these directories and updated whenever major new versions are deployed.

EDMS for the Control Systems: For ACS and ADT controls, a large number of documents have been put in place in EDMS. Luca will give an overview on this, together with the implementation in the layout database for controls and LLRF equipment in the next meeting.

9. AoB

Gravity Spares policy for LHC RF (Trevor)

Estimates on spares requirements for all systems were given to Trevor for his recent presentation to the LTC on behalf of the RF group "<u>LHC-RF Spares Policy</u>". We are generally reasonably well covered. Critical items are the purchase of two spare klystrons, aimed for this year, then later two loads/circulators. It is also important to have stock of special electronic components used in LLRF designs, notably FPGAs and converters. We expect that the cost can be taken from the LHC operations budget. (to be confirmed)

Next Meeting: Thursday 4th October at 08:45 in the JBA room.

E. Ciapala, 2nd October 2007.