LHC RF Meeting

26th July 2007

Participants: Maria-Elena Angoletta, Philippe Baudrenghien, Olivier Brunner, Andy Butterworth, Edmond Ciapala, Pierre Maesen, Daniel Valuch.

1. P4 RF Installation/Commissioning

General P4 planning: Cool-down of sector 4-5 was interrupted at the end of week 28 due to a leak, suspected between cold mass and insulating vacuum in a quadrupole near Point 4. This region is now at 300 K, while the remainder of the sector is at 150 K. The estimate for minimum overall delay is three weeks.

There will still be no free access into the tunnel; any urgent access needed must be done via the Cryo control room at P4, who will give a special access key.

Cryo status:

- **QRL eXtensions – insulation vacuum:** At the start of cool down there was in fact no pumping for the QRL eXtension in Sector 4-5. A check in the tunnel by AT-VAC showed that some condensation was forming on the outside of extension, above the cavities. (Due either to conduction or leaking of the valves?). AT-VAC has quickly connected the temporary vacuum pump, also placing it in on the floor instead of on the ACS modules. (Vibration problem)

- **Module He tank pressures:** These have remained steady at atmospheric.

Vacuum in LSS4 (Pierre)

- **Status:** Vacuum is good in the RF and neighbouring sectors. The only doubt concerns the short IP4 sector that connects the B2 modules. A slight leak is suspected but the vacuum there is still better that 10E-8. For the moment we read the values on the vacuum instruments in the klystron gallery racks, until the vacuum group can help to provide us with remote readout over the network.

- **ACS Module sector valves**. The mechanisms for driving the module sector valves will be changed during this period of delay in the cool-down. There is no risk of accidental opening of the valves. At the same time the vacuum group will do some work to install the compressed air system that controls the valves.

2. Klystrons:

Collector boilers: Four klystrons are still in UX45 awaiting new version boilers. We have sent a total of seven to Thales. Regrettably two were damaged in transit as the transport section had ignored our request for proper packaging. However Thales has managed to repair them. As soon as the first modified batch is received we will do the SM18 klystron and the four in UX45 that are out at the moment. We expect to have all sector 4-5 (8 klystrons) done by end of August.

3. SM18:

6 kW cryoplant status: The 'regeneration' (warm-up) carried out last week failed to produce any improvement in the degraded performance of this plant (15 g/s output compared to 30 g/s nominal) Urgent magnet work will end with the completion of tracking tests for OP by the beginning of next week. Cryo would then like to do the He level tests on P4 then they may do a complete change of oil in the whole system, to remove any water. Magnet tests will recommence in late September. Hopefully we can do work on the test cavity and LLRF before then.

4. Controls:

Rack Cabling: Now that all equipment is operational in the ACS UX45 racks, a final tidying up of the cabling has been done.

VME crates in Faraday Cages: The address conflict for the CTRV timing module will be sorted out with AB-CO.

- **Status Display:** Luca and Frederic have prepared a web based status display for the ACS system. A first version is under test and the final version will be made available soon. Similar applications will be done for ADT and LLRF.

5. LLRF

- **Faraday cages:** A final completion of cabling and tidy up is also in progress (J-C Perrier + FSU)
- **ACS Cable testing:** Measurements on the flexwell cables in UX45 are nearly complete. Over 100 cables have been measured, including all Antenna 1 and 2, cavity sum, klystron drive, and directional couplers (Cavity forward & reflected). For each cable measurements have been done with the cable open and with a termination. The data can be seen in the low level directory: http://dfs.cern.ch/dfs/Departments/AB/Groups/RF\Machines/LHC/LowLevel/Infrastructure/CableMeasurement
  S11 is measured in the time domain. Amplitude and phase of S11 are measured in the frequency domain with gating to isolate the reflection at the end of the cable only. The cable delay is measured by compensating the electrical delay to get 180 degrees phase shift at 400 MHz on the gated S11. Twenty of the 80 RF cables from klystron and circulator have also been measured (Module 2, beam 1). The remaining ones will be done as the cables are disconnected and freed during the changing of the klystron boilers.
- **Series production of modules for cavity controller:** Over 100 modules have been received or will shortly be delivered: 44 RF feedback, 25 DDS/Conditioning, 20 clock generator, 25 set point modules and 10 VTUs. Testing is progressing well using FSU support. Four switch and protection modules should arrive next week, with the rest by mid-August.
- **Phase measurement module:** The proto has been delivered and powered.
- **Attenuators for directional coupler signals:** We will add small switched attenuators on the reference signals from directional couplers for cavity forward, reflected and klystron forward power to maintain the same calibrations on all cavities (10 dBm for 300 kW) and avoid the complication of loading the values into the electronics. It will involve the construction of 48 special boxes to be added into the cavity controller signal distribution crates in the Faraday cages. Switched attenuators have been ordered together with all other necessary parts and we expect that the boxes can be built and fitted before powering.
- **Patch Cables:** The most rapid way of procuring the large number of SMA and SMC patch cables for the Faraday cages has been decided. Some cables will be purchased ready made and others made in-house by FSU with the help of the Design Office's cable cutting and stripping machine. The necessary cables and connectors will be ordered this week and we expect to have all cables by the end August or mid September.

Next Meeting: Thursday 2nd August at 08:45 in the JBA room.

E. Ciapala, 30th July 2007.