LHC RF Meeting
19th August 2005

Present: Luca Arnaudon, Thomas Bohl, Philippe Baudrenghien, Olivier Brunner, Andy Butterworth, Edmond Ciapala, Wolfgang Höfle, Trevor Linnecar, Pierre Maesen, John Molendijk, Eric Montesinos, Elena Shaposhnikova, Volker Rödel, Daniel Valuch, Frode Weierud.

1. ACS Couplers (Eric)

Couplers 122 and 123: Conditioning will continue a week longer in SA2 in view of the SM18 situation (below).

Couplers MC124 and 125: After problems with a faulty leak test system the baked out couplers will be re-tested with the repaired system. One coupler has already been baked and we are waiting to start on the second.

2. ACS Modules and SM18 (Pierre)

Module 2 incident in bunker: Around 14:30 on 12th August there was a helium discharge through the safety valves of module 2. One rupture disc on the cryostat also opened and vapour could be seen escaping. The ODH alarm system functioned correctly and the Pompiers arrived. The bunker was open at the time. It was originally thought that the He tank had developed a leak. The cryo recording over the duration of the incident however showed no indication of any significant prior overpressure. There was no RF in the cavity; tuning operation was being checked in cavity B. The recording showed the cryo system to have behaved exactly as it should, closing the inlet valve and opening the outlet, limiting the quantity of helium discharged. Suspicion that the problem might be a break in the cryo vacuum was confirmed as a likely possibility by Joachim; the chain of events being: air gradually enters the cryostat through the leak, condenses and solidifies on the cold surfaces of the He tanks, ultimately to evaporate rapidly when the temperature has risen to a critical level, due to the loss of insulation vacuum. Pressure quickly builds up inside the cryostat and the trapped air is released via the rupture disc (set to 1.4 bar). The He circuit was tested with the cryo operator the following Monday and was found good, although this needs definite re-confirmation once the module is cooled down. A leak test of the cryostat quickly revealed that the bellows of cavity A was broken. The tuner was removed and dismantled, the damaged bellows removed and a new one welded in the central workshops. The tuner will be refitted today, the cryostat pumped over the week-end and the He circuit will be re-tested next week. The frequencies of the cavities (relaxed position) will be rechecked before continuing LLRF tests in the middle of the week.

- **Cause:** The reason for the break in the bellows is not yet clear**.** The working range for these bellows is 17 to 42 mm. We cannot be sure that these limits have never on any occasion been exceeded, with the many modifications to the design of the tuner mechanisms.
- **Actions:**

1) **Limit switches, end stops and cabling**: must now be fully checked on all cavities.

2) **Bellows:** In order to minimize any risk we will have to change the bellows on all 21 cavities, adding to the heavy workload in completing the modules. Four bellows remain in stock, the additional mechanical parts can be obtained in order to have four sub-assemblies that can be fitted at any time without welding.

3) **Pressure measurement:** We must also fit at least one pressure sensor per module that allows pressure measurement above 2 bar.

Cryo domes: Parts for the first batch of 8 have now been delivered and two complete domes have already assembled and welded. A leak test under cold conditions will be done as soon as the necessary adapter pieces can be obtained.

3. ADT (Wolfgang)

- **Kicker tanks:** The first production series tank from Dubna has been officially accepted by the vacuum group (M. Jimenez). Five tanks are in Dubna, awaiting vacuum testing there. Six more have been completed in the factory, ready for shipment to Dubna. Eight still have to be made.
- **Supports:** The present support system allows some rotational movement at one end of the kicker. A suitable fixing method has to be found; it must not involve additional welding to the tank.
- **Electrodes:** All have been manufactured; they are being checked and cleaned in Dubna. One set of electrodes will be shipped by plane as soon as possible, the remaining ones will be transported by lorry and will arrive at CERN at the beginning of October
- **Amplifiers:** The first amplifier is still under tests; improvements have been made to the input matching. They can only be tested to 10 MHz at Dubna, the range 10 to 20 MHz has to be checked here. Some modifications, to improve maintainability, have already been made to the second amplifier and we may ask Dubna to modify the next two amplifiers before shipment. This will be discussed when Dubna representatives come here next week. Probably, however, it is best to implement all the changes on the next two amplifiers at CERN and then have final versions for the remaining 16 amplifiers pre-fabricated at JINR and not change the design anymore more for these.
- **Water cooled resistors:** High leakage current may be due to conducting solvent inside being released when hot. The problem is being discussed with the supplier. We need 80 such resistors. (In the meantime the supplier admits that it is likely that we have a broken ceramic plate in the first 4 resistors. We will receive a new design for approval soon. These items are on the critical path for testing of the power amplifiers.)
- **Water cooling:** (Eric) Confirmation on the water connections will come after final water flow and temperature measurements in B867.

4. Flexwell Cables

- **Delivery (Wolfgang)** Some cable in fact remains to be delivered, (7/8 inch air cored.) This will be followed up by Wolfgang.
- **Cable Lengths (Olivier)** With recent layout changes the lengths of a number of cables has changed with respect to the original estimates**.** The lists of coax cables and their lengths are continuously updated HERE on the AB RF server.
- **Spare cable:** The manufacturer has spare lengths of 3/8 inch unstabilized cable left over from the production of our order. This list has already been sent round by Wolfgang and can be consulted HERE.

5. LLRF (Philippe/John)

- **Fast timing for experiments: (Philippe)** 40 MHz bunch frequency signals are needed by each of the experiments: Beam1, Beam2 and 7 TeV reference, as well as a bunch synchronized revolution frequency ("Orbit"). This is part of the TTC upgrade project under discussion amongst the experiments. The proposal is that AB-RF transmits these signals all the way to the experiments, rather than simply to a common point in the CCC, where another transmission system, probably with different hardware, would have to be used to send the signals to the experiments. We will agree to the proposal under the conditions that extra cost is covered by the experiments and maintenance/piquet is made as light as possible. (e.g. first line intervention by the experiments themselves)
- **Cavity Controller backplane: (John)** Now that the interconnection layout for the modules of the cavity controller crates has become 'stable' (see backplane specification document and standard module connector), a printed circuit backplane will be launched for these crates. We will try to use the same backplane in all LLRF crates. Performance for fast signals from one board to the other can be pushed much higher than with the cabled backplane and there will of course be big gains in reliability and ease of fabrication.

- **ACS cavity conditioning module: (Philippe et al.)** The functionality and the basic design layout of the twin DDS module for conditioning of the ACS cavities was agreed in a small meeting through the week. John will start the design shortly.

6. Installation (Olivier)

- **SR4 Floor reinforcing for ADT supplies:** This has been checked by TS-CE, we are waiting for approval or news of any required modifications.
- **UX45 Infrastructure:** Work on the remaining cable trays is progressing, although somewhat slowly. The trays on top of the bunkers will be turned around the opposite way to ease access during cable pulling. Supports for the cable trays above the Faraday cages will be modified. The grounding systems inside the bunkers are being completed. Water cooling for the klystrons is being completed. The area around the Faraday cages is being prepared for their installation. QRL work is starting under the quay.
- **Cabling:** will start in mid September with pulling of cables from SR4 to the RBs and RAs; HV cables will be pulled in January 2006.
- **HV Bunkers:** These have been approved by SC.
- **HV cable extension boxes:** A solution, close to the original proposal, has been accepted by SC.

7. Diagnostics Acquisition Systems (Andy)

See presentation. Compact PCI based analog acquisition systems will be used to digitally acquire and store analog signals, mainly from the ADT systems. There are 64 channels with a sampling rate of 100 ms/s, 8 bits resolution and 10Ms memory. The number of modules depends on the number of channels per module proposed by the supplier. A market survey **MS-3362/AB/LHC** was carried out with AB-CO and AB-BT who require identical modules as well as 1 Gs/s 8 bit and 100 Ms/s 12 bit types. "Off-the-shelf" systems are insisted on. There will be two calls for tender; one for the 1 Gs/s systems and one for the two 100 Ms/s systems. APW systems will also require these types of boards but we would like to go to 2 Gs/s or higher. They will therefore be purchased later. It was noted that the timing system allows 1 us precision in all systems around the machine. Software systems allow 100 us precision.

8. AoB

- **Radiation and Access Issues in UX45:** Another meeting was held last week, (G. Roy, D. Forkel-Wirth and Olivier) - this time in UX45. Decisions on access to the top part of UX45 and on the use of the RAMSES (Radiation monitoring) system need realistic estimates of expected radiation levels. These can be re-made from tests done in 2001 and recent measurements in SM18.
- **Equipment Readiness Report:** Olivier will contact those who have not yet provided input for the equipment readiness report on the RF system for the August 26th TCC. **Reminder:** He has asked all equipment responsibles to provide a ~3 page initial contribution. **Three deadlines** need to be considered: sector test, start of hardware commissioning and first beam.
- **Electronics Design and Assembly: (Trevor)** We have been contacted by E. Van Der Bij and B. Magnin (TS-DEM) who need to estimate resources required for future work. We account for around 10 % of their total activity. They would very much appreciate a rough planning of the design and fabrication work which we expect to provide in the coming year. **(Action: Philippe, John….)**

They are also happy to accept small scale production of boards and custom chassis…

Next Meeting: Friday 2nd September at 08:45 in the JBA Room 864-2-B14.

E. Ciapala, 23rd August 2005.

Outstanding Actions (Reminders)

1. ***UX45 Earthing:*** *We have not yet managed to contact J. Pedersen on the layout for connection of the earthing lines to the main earthing systems* ***(Action Ed, Olivier with ST-EL)***