LHC RF Meeting
2nd September 2005

Present: Luca Arnaudon, Olivier Brunner, Andy Butterworth, Edmond Ciapala, Wolfgang Höfle, Trevor Linnecar, Pierre Maesen, Daniel Valuch, Frode Weierud.

1. ACS Couplers (Ed for Eric)

- **Couplers 122 and 123:** On removal from the test cavity minute metallic particles (apparently copper) were found on the inside of coupler 122. It was suspected that these may have come from the test cavity itself, being deposited during the opening of the vacuum. This was confirmed by the discovery of many of same type of particles at the bottom of the test cavity. The test cavity must therefore be cleaned and rinsed before couplers can be fitted again. The process will take around 2 weeks. In the meantime coupler 122 has been dismantled. Coupler 123 showed no visible signs of contamination but for the moment there is nothing to be gained by fitting it on a module. It now remains to find the reason for the contamination of the test cavity.
- **Couplers MC124 and 125:** Both couplers have been tested leak tight and will be remounted on the test cavity once it has been re-assembled. Since the test cavity will have been rinsed the conditioning in SA2 can unfortunately be expected to take longer than usual.

2. ACS Modules and SM18 (Pierre)

- **Module 2:** Following the incident of 12th August, the new tuner bellows assembly for cavity A was welded in the central workshops, the tuner refitted and the cryostat pumped to the correct vacuum without problems. The He circuit was successfully re-tested and the module cooled. Frequencies of all cavities have been checked and found not to have changed. After some minor conditioning of cavity A LLRF tests were started.
- **Tuner bellows analysis:** The broken bellows from cavity A is now with S. Sgobba TS/MME; we should get the results soon.
- **Cryo domes:** Leak test under cold conditions was successfully done for the first batch of 8 modified safety domes. Four domes were fitted to module 5 and the He circuit vacuum tested successfully.
- **Tuning compensation: (Olivier)** The temperature of the tuner frame, onto which one side of the compensating spring pushes, is around 100 K when the module has been cold for two weeks. The temperature of the helium tank flange, on which the other end of the spring is fitted, can go down to between 20 - 50 K. (The measurement is imprecise due to use of a Pt100 sensor, needing special calibration below 100 K). There are two concerns: the first is the behaviour of the stainless steel disc springs below 100 K (characteristics not given by the manufacturer); the second is the possibility of increased static losses due to increased conduction between the tuner frame and the He tank flange due to the springs. A rough estimate is an additional 4 W per spring; this would make an additional 32 W on module 5 where sets of 4 springs have been fitted on two cavities. The present static losses are estimated around 150 W per module. A suitable insulator between the spring assembly and the He tank flange would alleviate these additional losses and also allow the compensating springs to remain at higher temperature. A suitable material has to be found. (Resistant to the operating pressures, low temperature and radiation!)
- **Planning:** With the total time needed to do the work on the test cavity system then to condition the next two couplers in SA2 it is probably now impossible to meet the deadline of mounting four couplers on module 4 and starting power tests before the SM18 cryo shut-down in December. The possibility of gaining back some time by bringing forward work planned for early next year has to be looked at. If this cannot be done we will probably have 1 - 2 months delay in the completion of all four modules.

3. ADT (Wolfgang)

- **Supports:** The support system is being modified to prevent rotational movement at one end of the kicker. New support beams will be designed and made in Dubna. They should be delivered by mid-November.
- **Kicker tanks - Planning:** We expect the kickers to arrive 17th October. The procedures and planning have been agreed with M. Jimenez. The tanks will be reception tested in B867 and then taken to B113 for assembly and bakeout. One week is needed per unit in B113. Two kickers are joined together to make a 'module' of 3.2 m length. The work will be done in parallel, so that bakeout of the 10 modules can be done in 2 weeks. A complete test mounting of all the component parts of each the 'assemblies' (2 modules = 4 kickers, supports etc.) will be done in the 867 test area, towards the end of November. The assemblies' components will then be stored in B867 until they can be taken to the tunnel and finally mounted in place.
- **Layout and Databases:** The definition of a basic kicker module element, i.e. two tanks joined together, allows a more convenient way of defining the system in the machine layout than the present definition based on the more complex 'assembly' (GA) with its various configurations. The equipment codes in the database (and our own naming lists) will be updated accordingly. The final details, such as dimensions, positioning of fixing points and alignment markers, vacuum connections etc. now need to be put into the database. From this database information the vacuum group will retrieve all information about the interconnection pieces need for the installation. This data has to be entered for all systems; as a first step Wolfgang and Olivier will enter the ADT information. Olivier will be the official 'owner' of all the tunnel equipment (ACS, ADT and APW) with regard to installation and database (coordination with S. Chemli).
- **Amplifiers:** The input matching of the first amplifier is now good and the response is free of resonances up to 60 MHz. Tests have not yet been done at full power as we have no spare water cooled resistors (see below).
- **Water cooled resistors:** These items are on the critical path for testing of the power amplifiers. At present they suffer from high leakage current. This has been identified (confirmed by the manufacturer) as being due to cracking of ceramic plates placed between the stainless steel cooling plates – these plates are slightly deformed due to the pressure of the water flowing through them. The specification is 6 bars. The manufacturer will propose a solution based on reinforcement of the outside of the casing to counteract any movement of the ceramics; however we are limited by available space inside the amplifier and proximity to HV connections. Reduction of pressure in the tunnel to say 4-5 bar may avoid the problem, but would need lower return pressure to maintain the flow. More precise values for the pressure levels will be obtained after flow tests in B867. (We are presently waiting on calibration of the flow meters in B867)

(Action: Olivier/Eric)

4. Flexwell Cables

- **Spare cable:** A recheck of the exact cable lengths, based on the finalized layout of the cable trays in UX45, is being done by J-C Perrier. This will allow us to decide if we should take the offer of spare lengths of 3/8 inch unstabilized cable left over from the production of our flexwell cable order.

5. UX45 Installation (Olivier)

- **UX45 Infrastructure:** The remaining cable trays under the platform and the verticals near the Faraday cage are now in place. The floor is being marked with the positions of the equipment; some minor interferences will have to be corrected. A difficulty is the use of the transport area between the Faraday cages and the shielding wall for transit of QRL sections and power converters going into the UAs. This may interfere with assembly of the Faraday cages.
- **Faraday cage installation:** Since the work will be done by an outside contractor we have to ensure that the required procedures are organised and formalities done so that the work can start as planned at the beginning of October. The safety course has to be followed by the workers, the 'Plan de Prevention' drawn up, the VIC ('Visite d'Inspection Commune') done in the presence of CERN responsibles and the contractors and finally the AOC (Application d'Ouverture de Chantier) must be

made. (All to be seen with TS-IC). These issues should be taken up with the contractor as soon as possible and the extra visits to CERN organised. **(Action: J-C Perrier with Philippe)**

- **Access system in UX45:** A proposal on access conditions in the UX45 cavern has been made by Doris Forkel-Wirth (SC-RP-SL). This closely follows that originally discussed with G. Roy.

In short: Doors to be installed to prevent access to the platform and the tunnel roof from the RF area (two doors) and from the cryo area to the tunnel roof (two doors). These four doors are interlocked to the RF only, using the PC MCBs - they are not integrated into the LASS system. RAMSES protects the lower 'RF working area' of UX45 and the 'cryo working area' on the cryo side of UX45. Access from US45 to the latter area would not be restricted (Initially). We are in agreement with this proposal.

6. LLRF (Andy/Ed for Philippe/John)

More detailed reports will be given when the present series of tests has been completed.

- **RF Feedback:** The system was quickly installed and set up. Open loop and closed loop responses have been measured. Performance is as expected and the closed loop transient response seems very good.
- **Tuning Control:** The tuning control is proving less predictable; while the system can track frequency changes the behaviour is somewhat irregular. Considerable noise around 140 to 160 Hz is provoked during frequency modulation, probably related to mechanical resonances. The stepping rate and loop response will certainly need to be adjusted to avoid problems.

7. PLC Controls - Status (Luca)

See Luca's presentation. Hardware series production for ACS is well advanced, for klystron and HV equipment it is almost complete. Wall mounted I/O units for cavities and cryo are about 50 % complete. Development of some missing items, level detectors, crowbar detectors has been completed and production now starting. HOM patch panels are in production (Daniel) and the new power converter interface has been tested. The internal PLC software is complete. Software interface via IEPLC (Industrial Ethernet for PLC) in now being made, together with AB-CO. A first test with AB-COs FESA will be made on the ADT in B867. A solution to the problem of a suitable time-stamping mechanism for the PLC systems has been found. For ADT prototypes of much of the equipment have been tested in B867, however the interlock system remains to be settled. The measurement system for power supply voltages also remains to be developed. The spares policy is not to have complete replacement assemblies but rather to use plug in elements. There are roughly 10 % spares for these elements. Cabling lists are completely defined with TS-EL.

8. AoB

None

Next Meeting: Friday 16th September at 08:45 in the JBA Room 864-2-B14.

E. Ciapala, 7th September 2005.

Outstanding Actions (Reminders)

1. ***UX45 Earthing:*** *We have contacted J. Pedersen on the layout for connection of the earthing lines to the main earthing systems* ***(Action Ed, Olivier with ST-EL)***
2. ***SR4 Floor reinforcing for ADT supplies:*** *This has been checked by TS-CE, we are waiting for approval or news of any required modifications*