LHC RF Meeting
26th November 2004

Present: Luca Arnaudon, Olivier Brunner, Andy Butterworth, Philippe Baudrenghien, Edmond Ciapala, Wolfgang Hofle, Trevor Linnecar, Pierre Maesen, Joachim Tückmantel, Daniel Valuch, FrodeWeierud.

1. ADT Progress (Wolfgang)

- **Function generator:** ADT system gains needs to be reduced from nominal to some lower value after the injection of each batch. We plan to do this with the same (PO-FGC) function generator we will use elsewhere. A question was raised as to whether a re-load of the function is needed after every run through of the function - this would be difficult to guarantee in the time between batches. To be checked. **(Action: Andy/Ed)**

(Use of the LHC serial adapter approach for GFAS generated functions is being studied for PS applications, e.g. damper and 1-T feedback, as is also an embedded FPGA approach.)

- **Grid supplies:** A problem with high inrush currents in the supplies received has been solved by increasing the delay in the protection circuits. (our 400 V has lower impedance than that of the supplier)
- **Kickers:** The supports have a resistance in the kilohms range, which may explain the low resistance, previously attributed to the ceramic rings.
- **Amplifiers:** Tests at full voltage will be done when demineralized water is available at Dubna.
- **Anode supplies:** Damping resistors may need to withstand 600 W; those fitted are rated at 500 W.

2. Cables and Flexwell order

- **Cabling plan:** The planning for the various phases of cable installation is being prepared by TS-EL.
- **ADT drive cables:** A solution has been found, with the integration team, for the direct routing of these cables. There are 16 per side, and will go from UX45 through existing spaces in the shielding and tunnel walls, then via new cable trays on the tunnel roof to the ADT amplifiers at each side.
- **Flexwell Cable ordering:** The order should be put out in 2 weeks. Cable trays have to be finalized, cable lengths calculated and everything checked. **(Action Jean-Claude + All concerned)**

3. UX45 Integration – Cryo Lines

Each ACS module will have both a safety release into the UX45 cavern and a return line to the main vent line which takes gas to the surface. These lines (diameter 200 mm and 70 mm respectively) have to be integrated. The original proposal was to take the safety release via the tunnel roof. If taken via the moveable blocks near the centre, the construction of the blocks would be more complicated and the line would need to be disconnected when the blocks have to be removed. If taken via the fixed roof blocks at the ends, which support the tunnel ventilation units, the block design would again be complicated and there may also be radiation issues. Passage through the wall on the klystron side into the space between it and the shielding wall would mean shorter lines and can be done by extending four of the waveguide holes horizontally – still possible as the wall is still being finalized. This is being followed up by Serge Grillot (TS-IC). For the vent line returns more information is needed from AT-ACR, notably the position of the main vent line in UX45. This will be followed up with AT-ACR. **(Action: Ed/Olivier)**

4. ACS Modules and SM18 (Pierre)

- **Module 5:** Four cool-down cycles have been done
- **Module 3:** Will be taken to the clean-room for removal of couplers.
- **352 MHz:** Tests are ongoing, with the Soleil module in the bunker.

5. ACS Couplers

Conditioning of couplers 114 and 115 in SA2 has finished. Couplers 116 and 117 have been successfully baked out and will be fitted to the SA2 test cavity next week.

6. ACS Power (Olivier)

Klystron 12 testing is nearly finished. Klystron 9, which had a blocked water pipe, has been delivered. The ex SM18 production 'prototype' load which suffered water leaks has been replaced by the manufacturer with a standard production series load, at no extra cost.

7. LLRF (Philippe)

- **Faraday cage:** The invitation to tender should go out in mid-January. Four months are needed between awarding the contract and starting the work. Working in the UX45 is probably not a special difficulty as suppliers are used to installing cages in awkward places.

8. Klystron ripple and compensation (Daniel)

- **Power Converter:** AB-PO may be able to reduce 100 and 600 Hz components.
- **Compensation systems:** Daniel presented two proposals. Feed back around the modulator can only reduce amplitude ripple and is not effective for phase ripple. (The modulating anode can not change the transit time of the electron beam, only the amount of current). A compensation system is proposed, in which an additional voltage, equal to the total peak-to-peak ripple and noise, is introduced in series with the converter at the ground side (in the HV bunker). The required voltage would be up to 600 V. This could be done with a separate power supply. A cheaper solution would be to use a bank of high power semiconductors, connected in parallel. A similar approach has been used for magnet supplies in the PS. The device could probably be fitted into a 19 inch rack.

  The next step is to discuss the proposal with PO group. **(Action: Daniel/Olivier)**

9. AoB

- **LEP Waveguides in ISR:** Those for IHEP (Beijing) will be sorted for the end of the year, for Linac 4 the work is almost finished. GSI have still to make the official request. A decision on what will be sent for scrap will have to be made soon.
- **EMC Workshop:** Generally considered as having been a useful event. Some points:
  - Our earthing system proposal for UX45 was not questioned
  - Is 120 mm2 large enough for the earth bars in the rail trenches?
  - Would we be better to connect racks and Faraday cage to the IR4 central earth point (via a second pair of bars in the vacant trenches) rather than the machine ground?
  - Earthing of the HV supply/return cables screen at both ends?
  - Are stepping motors and drive electronics a problem?
  - Would we need an additional shielding duct/pipe around some cables?
  - Should we have non-anodized chassis everywhere?

Philippe has agreed to be our EMC co-ordinator.

Next Meeting: Friday 3rd December at 08:45 in the JBA Room 864-2-B14.

E. Ciapala, 1st December 2004.