LHC RF Meeting
12th February 2003

Present:
Luca Arnaudon, Thomas Bohl, Andy Butterworth, Olivier Brunner, Elena Chapochnikowa, Edmond Ciapala, Trevor Linnecar, Roberto Losito, Eric Montesinos, Volker Rödel; Joachim Tückmantel, Daniel Valuch.

1) EVM and follow up (Ed)
The EVM upload planning for the different systems was presented. See the following link: http://ais.cern.ch/ais-only/projs/evm/data_collection/Schedule.htm EVM data can be seen at http://pptlhc.cern.ch/evm_dev/main.jsp
The EVM management approach is now to take the different systems one after the other. For each system there are 3 meetings planned between the designated system responsibles and the EVM team, 3 weeks overall being allowed to reach a 'final approval' state and introduction into EVM. Our first meeting is 3rd March 2003. For LHC RF 5 of our 9 overall 'sub systems' have been put into the requested Excel format needed for upload i.e. ACS Power Couplers, ACS Klystrons and Power, ACS cavity modules + SM18, Controls Electronics and dampers. In order to meet the deadline we need to get the planning for the other systems in Microsoft Project format by 3rd March - i.e. Low Level RF and Beam Control (in progress), Software and Diagnostics, ACN and Infrastructure + Layout.
Actions: Andy, Volker, Eric, Philippe.

2) List of actions from previous series of LHC RF planning and status meetings
Taken point by point:

- Cryo issues
  Still to resolve – See SC Modules & SM 18 below
- Study and tests of power equipment for klystron linearisation electronics specs
  Measurements on all production klystrons by FB & MK specialists, 2 klystrons measured so far.
- Power system behaviour with transients, requirements on interlocks
  Study and tests in SM18 test chain to be done
- Positioning and numbers of arc detectors and directional couplers in waveguides
  Done
- Arc Detectors (near cavities) – Radiation proof solutions to find
  Still to be found
- UX45 earthing
  Linked to UX45 layout – see below
- SM18 chain planning – Helium supply and space allocation to confirm.
  He supply agreed with cryo and space agreed with Magnet Test responsibles
- Clean room availability, personnel
  Agreed with ATS group – maintain contacts!
- SM18 Power Supply – Replace or Modify
  Now being replaced with LEP supply
- RF detector hardware for signal and power measurement
  Still to be followed up by CS/FB
- Electronics arrangement in UX45
  Rack layouts now decided – ACS and ADT, including cooling etc.
- Detailed cabling lists and "Demande Installation Cablage" – responsible person
  JC Perrier will be contact man RF/EST. Lists will be in Excel format as close as possible to that needed for 'Demande d'Installation Cablage' (Luca et al.) Remaining work concerns interconnections between major pieces of equipment – to finish during this year

3) UX45 layout (Volker et al)
RF layout in UX45 3-D modeling is needed to verify the installation. Normal 2-D plans have been made for all parts of the installation. For the tunnel installation and for the cryo side of UX45 this activity is under the responsibility of by C. Hauviller (EST/IC). The RF side of UX45 should therefore also be done through him. **Action:** Volker to contact C. Hauviller.
The vacuum layout in the tunnel for ACS, ACN and ADT has to be done together with our vacuum contact man, M. Jimenez. (Reminder. M. Jimenez is the contact man for all vacuum work actually in the tunnel. Vacuum work required by the LHC project that has to be done before installation, e.g. in SM18, for the reception of the damper, ACN cavity tests etc. is handled via H. Preis – see attached memo. below.)
Water-cooling was the subject of a meeting with the cooling specialists on 13th October 2002, when it was agreed that sufficient capacity piping, including the needs for ACN, would be installed right from the start. The main points of this meeting are summarized in **Appendix 1.**
Electrical installation: The situation regarding the electrical installation infrastructure for ACN needs clarification
Cable trays and their layout will be studied soon.
Pick-ups: The 5 pick-ups per beam, their space requirements and positioning have to be defined. **Action**: Thomas + Volker.
A Point 4 installation meeting takes place on 12th February pm.
ACN: An ECR is requested by TCC for the staging of the installation. **Action:** Volker
Machine Installation Committee. C. Ruivet represents us on this.

4) Power Couplers (Eric)
Ceramics Two ceramics have been received from Verelec, 2 months ahead of expected delivery. The workmanship and quality look good and they are within tolerances. Assembly of 2 couplers can now proceed and should take 10 weeks. Another 2 ceramics will be delivered soon. These very successful results mean that if all goes well a set of four couplers could be completed and conditioned in SA2 by the end of June.
SA2 Tests. Both kovar and copper couplers have reached 550 kW continuous, under all reflection phasings. Further tests with another pair of couplers (kovar and copper) are ongoing in parallel with the coupler assembly activities and are expected to last 4 weeks.

5) Ions in LHC- Implications (Elena)
All LHC equipment is already prepared for operation with ions, no special modifications are needed. Implications for SPS RF systems are to be considered elsewhere.

6) Radiation in UX45 (Andy)
Recent considerations by Thijs Wijnands (AB-CO) indicate that there might be a risk to electronics near the beam pipe from high energy neutrons from beam-gas collisions. These can interfere with the operation of SRAM inside FPGAs. We intend to make heavy use of FPGAs in the RF feedback and beam control systems situated in the cryo side of UX45. It is essential to have knowledge of the expected likelihood of failures due to these single events and if above a 'tolerable' level what would be required for shielding. Arc detectors may also be susceptible, but for critical measurements these will be used in pairs and thus less vulnerable (Olivier). Geometric configuration is a major part of the simulation effort, however Stefan Roesler (TIS/RP) has already done this for UX45 in the studies on integrated doses for our layout studies. We should therefore make use of this to get an analysis as soon as possible. The subject will be discussed at the next meeting of the TEWG on Friday 14th February.
Action: Andy & Volker.

7) SC Modules and SM18 (Roberto)
Modules: The cavities of all 5 modules are tested and mounted. All cavities reached 9 MV/m in low power testing and have Qo>2E9 at 5 MV/m. The Vacuum group has now finalized the second beam tube; the interior will have a NEG coating over copper. The existing tubes will

now be treated. The thermal insulation scheme (for bakeout) was successfully tested last year. Thereafter final cabling will be done and the modules closed and leak tested. Fine tuning of 2 modules has been done, the remaining 3 are ongoing. LHe will be available in April for thermal cycling tests. Items to resolve include the choice of safety valves and LHe level gauges. A series of 6 gauges was purchased, unfortunately one had a vacuum leak, to be investigated before purchasing the total numbers needed. Supply via the Cryo group remains a possibility, but the mounting method would be slightly different. We should decide by the end of the year.
Cryo Linkman Our agreement with L. Serio that he should be our linkman has to be agreed by the respective group leaders – **Action:** Trevor (This was agreed immediately following the meeting).
SM18: The discussions on possible release of RF space in SM18 have resulted in an arrangement whereby some space has to be given up in the area of the vertical cryostats. A general clean up of the RF area will be done. **Action:** Roberto.
Regular SM18 meetings (Fridays 09:30 am) will be held by Roberto - Initially these will coordinate installation of the klystron and electronics and will continue during the phases of conditioning of the modules+couplers and the planned overall system tests.

8) ACN Cavities (Roberto)
Two cavities have been received and are very close to the required frequency. The remaining 6 will be delivered by end of September. One cavity however shows some discoloration in the interior, possibly due to oxidation. We should check that there is no potential problem. **Action**: Roberto

9) Controls Electronics (Luca)
The controls for the klystron and HV system being installed in SM18 will resemble LHC installation as closely as possible. Cavity and module controls will be installed later in the year. A general problem concerning costs of stores material compared to direct outside purchase was raised.

10) General
Storage space in SG4 Our request is in conflict with the intentions of EST/IC (D. Peytoud). We should nevertheless try to negotiate the larger part of SG4 for the storage of material from SM18 and possibly waveguides. **Action:** Volker & Olivier
ex LEP Racks Apart from 20 sets of klystron racks reserved for SPL we propose that the remaining racks be stripped, useful material safely stored and the racks themselves used for LHC. We need assurance however that there are no other potential customers for the racks assembled as they are. Olivier has sent a memo to Carlo Wyss.

Next Meeting
Wednesday 19th February 09:00 in 864 1 C 01
Agenda
- Follow up from last meeting
- UX45 layout & planning
- Round table

E. Ciapala, 13th February 2003

Appendix 1
Points from meeting with the cooling specialists on 13th October 2002

- Layout: Two separate water circuits Left & Right in UX and UL, arranged for constant flow in each system. Hydraulic studies and cost estimates to be done
- Water piping to klystrons not in cost to completion
- 20m3/h demineralised water for HV bunkers
- Chilled water for rack cooling systems
- Water in at 27 degC – follows cooling specs agreed in TCC
- Adequate section pipes allowing ACN from the start
- ACN will need compressed air – pick off points must be defined already
- Purity of water out – impurities, radioactivity ?
- Possibility of flooding to 40cm depth in UX – precautions for equipment
- Plants 112, SA2, SM18, H867, responsible for each system must estimate repair, annual maintenance needs and operating costs.
- Budget responsibilities to clarify.

29.01.03

MEMORANDUM

To: H. Preis, R. Losito, W. Hofle
From: T. Linnecar, E. Chiaveri
Copy: E. Jensen, E. Montesinos, E. Ciapala, V. Rodel, M. Jimenez, P. Strubin

Subject: **LHC RF Vacuum work**

M. Hansuli Preis is in the AB/ATB group where he is responsible for design and testing of vacuum components. He has had a considerable amount of work over his career at CERN in the field of RF and in particular with super and normal conducting cavities and their associated components and indeed is an expert in this area.

All work for RF at CERN is now concentrated in the AB/RF group although the AB/ATB group still remains responsible for the delivery of the 200 MHz NC cavities for LHC. It is very interesting for the AB/RF group that M. Preis should help with the vacuum work that has to be done for the LHC project so that the CERN RF effort can continue to profit from his experience.

In the AB/RF group the two engineers responsible for subjects in LHC with definite vacuum requirements are:

M. Roberto Losito – LHC 400 MHz SC and 200 MHz NC systems
Dr. Wolfgang Hofle – LHC Transverse damping system.

For the 400 MHz SC system and the transverse damping system there is vacuum work to be done for the testing of components, the reception of equipment, and the final installation in LHC. There is also work to be done for the tests in SM18. For the 200 MHz system the work is more limited as the cavities will only be installed at a later date, however the reception of the cavities has to be assured.

M. Preis will discuss directly with the two engineers named above to decide both the daily and long-term vacuum requirements for these projects. They will decide together the work packages that must be sub-contracted to the LHC vacuum group or the material resources and manpower that must be assigned to do the job. M. Preis will also continuously liaise with the vacuum group at CERN to ensure that design and procedure decisions are acceptable to the vacuum group.