LHC RF Meeting
7th May 2003

Present:
Luca Arnaudon, Philippe Baudrenghien, Andy Butterworth, Olivier Brunner, Elena Chapochnikova, Edmond Ciapala, Trevor Linnecar, Roberto Losito, Joachim Tückmantel, Volker Rödel.
Excused: Thomas Bohl, Wolfgang Höfle, Eric Montesinos.

The meeting was devoted to the vacuum system:

1.1) Vacuum Layout (Volker)

The layout, from the document LHC-LVW-ES-003, was presented. *Note that this document in now in the approval process and the deadline for comments is 12th May.* From the layout point of view our main interest is in the positioning of the sector valves. Each SC module has its own pair of valves, one mounted at each end together with a sputter ion pump. For the ACN cavities there is one valve before the first cavity as seen by the beam - next to the D3 magnet - and one after the last of the group of 4 cavities. There is also a valve on the other beam pipe next to the D3. The following questions arose:
1) Adequate protection for cavities (especially SC cavities) - whether the arrangement provides sufficient protection the event of vacuum incidents. (Note that all valves are "slow valves" with a delay of around 2 seconds). This should be taken up with the vacuum group. (**Action:** Volker)
2) Risk of contamination inside SC modules from ferrite in neighbouring wide-band pick-ups. For beam 1 in I4R the pick-ups are next to the beam pipe, while for beam 2 in IRL they are in line with the second beam tube of the nearest module. The following points were made:

- Since the ferrites do not heat there should be no risk of contamination after bake-out.
- The ferrites are at a radius well outside the normal vacuum chamber dimensions.
- A pumping port could be included in the design in case of need. (**Action:** Thomas)

It was agreed that a pick-up should be installed in SM18, next to a module under test.(**Action:** Roberto with Thomas)
3) Effect on sensitive BDI equipment e.g. synchrotron radiation measurement equipment:
Equipment relatively far away on the other side of the D3 magnet should not be affected by X-rays from conditioning and accelerated electrons should be blocked by the dog-leg. For equipment adjacent to the first ACN cavity shielding may well be needed. This should be brought up with BDI (**Action:** Ed)
4) Positioning of doors and shielding to allow access in RAs when conditioning cavities. Discussions with RP have started and should be followed up. (**Action:** Volker). The document LHC-Y-ES-0002-10-00 recently published on access zoning appears to be based on a pre V6.4 layout.

The positioning of pumps and gauges has been agreed with VA group for the ACS and ACN systems. The situation for the ADT kickers still needs to be clarified. (**Action:** Volker and Wolfgang)

1.2) Vacuum Controls (Luca)

Luca's presentation is summarized in Appendix 1. The control layout and the responsibilities between VA GROUP and ourselves are defined for ACS and ACN. We are responsible for the ACS main coupler vacuum measurement units. These are situated in our racks, as the outputs are used directly for conditioning. In general HV is interlocked on the vacuum pumps and RF interlocks on the gauges. The various interlock levels should be specified. The situation for ADT still needs to be defined.

2) AoB

i) Cabling & integration (Trevor) The presence of QRL, cable trays and waveguides will make access to the cavities very difficult after installation, especially in the area near the outside cryo wall. This will be looked at in the next meeting.

ii) ACN Cavities (Roberto) Cavity 8, the last in the series, has had part of the outer surface of the inner part nose cone machined to too small a diameter. A solution has been proposed, based on fitting a sleeve over the wrongly machined region. (See diagrams below). The end near the cavity will be wider over a short length so that the sleeve can be welded in place without interfering with the existing weld. This will have no influence on the characteristics or performance of the cavity. The manufacturer has agreed to adopt the proposal.

iii) ACS cavities (Roberto) Module 3 has been cycled and re-measured cold. The frequencies have moved as expected and there is now sufficient tuning range on both sides of nominal frequency. The exact figures will be made available (**Action:** Roberto)

iv) Cryo Valves (Roberto). L. Serio has confirmed that two input valves will be provided for each module, as agreed during discussions between RF and Cryo in late 2001. One covers normal operation – up to 250 kW and the other up to 700kW for high field operation when needed, with less precise flow control. However a 2-position on/off valve has been specified for the output. This would only allow pressure variations to be kept within +/- 50mbar, compared to our +/- 15 mbar requirement. The cryo specialists will propose a solution.

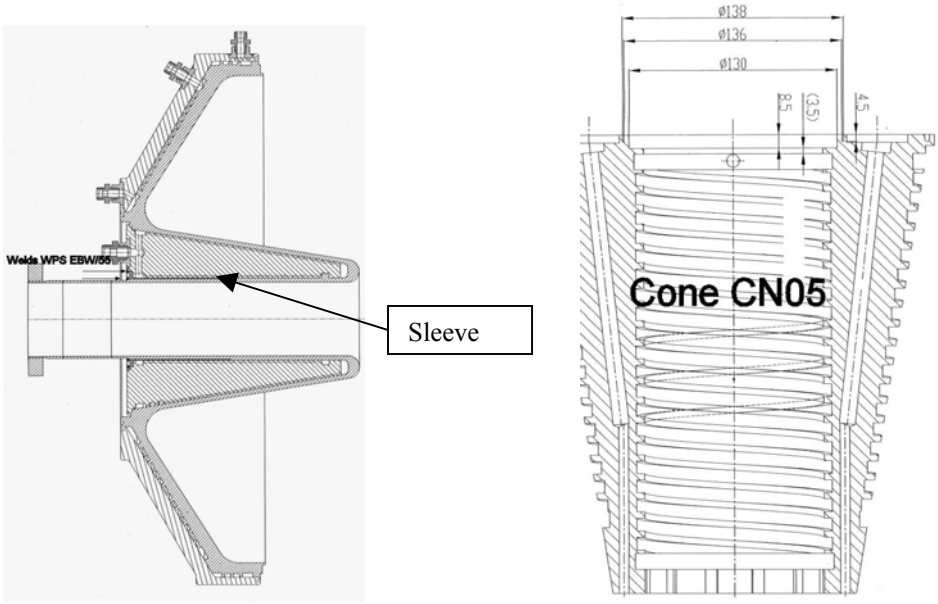
v) LLRF (Philippe) A prototype analog I/Q demodulator will be ready for the end of the month. Work is progressing on the tuner module analog and digital parts. A new notch filter to eliminate a peak in the klystron response has been developed, using a new wide band programmable capacitor.

vi) Ex-LEP racks & equipment (Olivier). Official permission to dismantle LEP equipment and re-use the racks for LHC has now been obtained from Carlo Wyss. A list of material to be recuperated will be circulated (**Action:** Olivier)

Next Meeting

Will be devoted patch panels, interconnections and cable the routing around the cavities, for those interested. In Sylvain Girod's office 864-2-C04, Wednesday 14th May 2003 at 09:00.

E. Ciapala, 12th May 2003



ACN Cavity modification

Appendix 1 Vacuum Controls

ADT RF Vacuum

- Not fully defined ..
  Pumps position to be decided? Gauges? Vacuum Interlocks?

ACN RF Vacuum

- 2 sector valves for each group of 4 cavities, one on each side of group.
- One pump on each cavity, each with interlock to HV
  Pump controller in the ACN racks UA43 and UA47 (6 x 3U needed each side)
- One gauge on each cavity, each with interlock to RF (Signal for conditioning?)
  (1 x TPG300 for 2 cavities =1 x 3U needed for 4 cavities)

ACS RF Vacuum (Machine)

- Sector valve/pump assembly mounted at each end of each module
  Pump interlocks in series, i.e. one HV interlock per module to fast interlock controller.
  Pump controllers in UA43 and UA47 under VA group responsibility
- One gauge on each module, with readout (to PLC?)
  One RF interlock per module to fast interlock controller

ACS RF Vacuum (Power Coupler)

- One gauge on each power coupler - Signal output for conditioning!
  (1 x TPG300 for each module => 1 x 3U needed for each ring)
  One RF interlock for each coupler to fast interlock controller

ACS RF Vacuum (Cryostat)

- One pump per module (1 x 3U control unit needed for each module in RF racks)
  One Pump Power Supply for two modules (1 x 3U needed for two module)
- One gauge on each module, signal output to PLC
  (1 x TPG300 for each ring => 1 x 3U needed for each ring)
  One RF interlock per module to fast interlock controller

Summary

ACN	Machine Vacuum
Measurement	1 per cavity (gauge)
RF Interlock	1 per cavity (gauge)
HV Interlock	1 per cavity (pump)

ACS	Machine Vacuum	Power Coupler Vac.	Cryostat Vacuum
Measurement	1 per module (gauge)	1 per cavity (gauge)	1 per module (gauge)
RF Interlock	1 per module (gauge)	1 per cavity (gauge)	1 per module (gauge)
HV Interlock	1 per module (pumps)	NONE	NONE