LHC RF Meeting 19th March 2004

Present: Luca Arnaudon, Andy Butterworth, Philippe Baudrenghien, Olivier Brunner, Edmond Ciapala, Trevor Linnecar, Roberto Losito, Volker Rodel, Joachim Tuckmantel, Daniel Valuch.

1) ACS Couplers (info from Eric)

• Conditioning of the first two couplers for Module 1 is progressing well in SA2; 200 kW has been reached with 10 us/10 ms pulsing. This good progress matches that for the previous set of couplers.

2) SM18

• **Waveguides:** The new waveguide arrangement in the bunker is under study. It will allow 30 cm extra space for near the wall for access to the module.

• **Controls:** The delayed conditioning of the next module would allow time to install improved basic application software. Evolution of the present JAVA based system presently lacks clear guidelines and support from AB-CO in the short-term, at least. One recommended and supported system for the PLC based controls systems mainly used in SM18 is PVSS. A version that might easily be adapted for RF is in use for AT-ACR. Evaluation will be done together with AB-CO-IS.

(Action: Luca & Pierre)

3) Equipment Naming

• Volker presented the completed <u>naming for all equipment in the tunnel</u>, now agreed with those responsible for the LHC naming baseline and included in the database. In particular the damper kicker assemblies are finalized. Two actions remain:

- 1) Putting the names on the actual layout diagram. (Action:Volker with Sylvain)
- 2) Defining the 'operational' names for the equipment, also putting this information on the layout. (Action: Equipment Responsibles with Volker)

This should be presented at a meeting in the near future.

• This together with the list compiled by JC Perrier, now makes the required definitions of all equipment complete for the "DiC".

4) LHC overall planning – Installation and Commissioning

• In order to absorb the delays in QRL production, significant changes are being proposed to the installation planning. Trevor has been asked to present the implications for the group, i.e. if and how we can meet this revised schedule:

• **Commissioning**: Olivier presented the first <u>draft estimate of RF commissioning planning</u>. For ACS this is divided roughly into two parts; equipment tests without helium (24 weeks), then tests and system commissioning with helium (24-30 weeks). While some optimization may permit certain activities in parallel, the estimates are probably a realistic minimum; they assume for example that all the services are 100 % available when needed. Additionally it should be able to fit the ADT commissioning inside these periods, but only if it is possible to schedule manpower and resources accordingly. These commissioning times can not be compressed, whatever the starting date: warm testing can only be started when a large part of installation is completed (in UX45) and the basic services are available, cold commissioning needs continuous 24-30 weeks with helium.

• **Planning**: From the above and given that the <u>proposed revised planning</u> shows first cool-down for RF from the end of May 2006 (sect 34) and June (Sect 45), the ACS modules could be commissioned by February 2007, but only with the conditions that the sectors would be kept cold (not planned at the moment!) and that RF testing and magnet commissioning could be carried out together (this will only be known after tests in preceding sectors!). From a planning estimate (See Gant Chart) based on these ACS cool-down dates, completion of RF installation by end January 2006 and QRL installation in UX45 by end May 2005 (permitting the start of civil engineering in UX45) the following can be concluded:

a) There is a window of only 8 months for CE in UX45, upgrade of services, cabling and actual RF installation. This seems very tight and would need detailed breakdown to check feasibility.

b) The time for warm tests and commissioning is only 12 weeks, half that needed.

c) Fitting in the 24-30 week period of cold QRL operation necessary for ACS commissioning will in any case require the QRL to be cool for a longer period than presently planned after magnet commissioning.

► A proposed <u>modified version of the planning</u> shows civil engineering work, services installation in UX45 and connection to the QRL during the period June 2005 to May 2006 (13 months instead of 8), warm commissioning from June to mid October 2006 (22 weeks), then SC cavity cool-down and cold commissioning from November to May 2006 (28 weeks), after the magnet tests. Running the QRL continuously from the completion of the magnet tests till the end of January 2007 is essential.

5) AoB:

• **Cryo Meeting:** A meeting (see draft minutes) was held with L. Serio (our cryo linkman) and L. Tavian (AT-ACR group leader), together with TIS representatives Ralf Trant and Gunnar Lindell, to discuss outstanding items for the ACS system.

• Normally pressure above 1.6 bar will release by fast opening of the output (line D) valve. Safety quench valves operating at 2 bar will return helium to the cryoplant via special pipes, still to be defined. Ultimate security is provided rupture valves, operating at 2.5 bar, which will release helium into UX45 via ducts passing through the RUX45 roof. There will also be a warm recovery line to return gas to the cryoplant in the event of difficulties with Line-D. A safety valve will automatically block if the pressure in Line-D goes above 2 bar.

• The design of He circuits of the SC modules will be checked again by ACR to identify possible risks to safety valve connections in the event of icing.

• Nominal pressure will be 1350 mbar; with RF interlock at 1400 mbar. Pressure will be regulated to within ± 15 mbar. The performance of cryo in the LHC machine is promised to be at least as good as that in SM18.

• A separate cryoplant is ruled out for the start-up.

• Cryo agree that all controls & instrumentation which they might propose or for which they are responsible must be tested in SM18 before it can be considered for installation.

• The cavities have to be connected to the QRL before the cool-down of the magnets; they can be cooled during magnet cool-down. Commissioning can start immediately after first cool-down. The output (Line-D) regulating valve is expected to be able to handle the pressure fluctuations on line D. Experience in the commissioning of preceding sectors will tell if the pressure is stable enough to allow RF operation during magnet testing.

• Klystrons: Three more circulator/loads have been received. Tests on these are ongoing.

• **Dust Traps:** Specs are being studied by BT. Basing the design on the damper kickers is still being considered.

• **LLRF progress:** The RF font end module for the cavity tuning control has been tested. The performance of the RF part looks good; noise and 380 MHz LO pickup are well within specs. The VME interface in the FPGA has also been tested, with successful access to registers and memory. FESA software has also been used to set and read the data and a JAVA application to display the results on a console. All of these results are very encouraging indeed.

Next Meeting:

Friday 26th March 2004 at 08:45 in J. B. Adams Room (864-2-B14)

E. Ciapala, 19th March 2004.