

LHC RF Meeting

23rd March 2007

Participants: Maria Elena Angoletta, Luca Arnaudon, Philippe Baudrenghien, Thomas Bohl, Olivier Brunner, Andy Butterworth, Edmond Ciapala, Eric Montesinos, Wolfgang Höfle, Trevor Linnecar, John Molendijk, Elena Shaposhnikova, Joachim Tückmantel, Daniel Valuch, Frode Weierud.

Excused: Pierre Maesen (RAT Meeting)

1. News from ICC and P4 general (Olivier)

🚧 Olivier gave the status from last week's (16th March) ICC. Cool down sector 7-8 ongoing, slowed by a compressor stop. Only 13 magnets only remain to be installed. The new start date for sector 4-5 pressure test is 11th May. The roof blocks can not be put in place yet as warm magnets are still being transported through P4.

2. UX45/RUX45 installation/commissioning

🚧 **Activities** have been less intense – ongoing and pending items:

- **Water:** Maintenance work is being done on the system, Restart next week.
- **SC Report:** Waiting full results.
- **Cabling:** The A5 team is completing the cabling for the arc detectors.
- **ADT Layouts & cabling:** The work of completing the layouts for UX45 switch matrix, ADT fast digitizers and clock distribution cabling details is ongoing. Additional 3/8 inch flexwell connectors need to be purchased for this and also for the HOM cable loads.
- **Cryo and WRL:** Our installation of the HeG return lines is complete, the lines have been tested and made pressure tight.

3. ACS Modules, Couplers and SM18

🚧 **He tank pressures & safety valves:** Calculations on maximum pressures under various fault conditions, with four domes equipped with safety valves and rupture discs and the new release settings, will be provided by Luigi Serio (AT-CR)

🚧 **Single cavity and LLRF tests:** The single cavity module was run at medium field and until the end of last week, to continue the LLRF tests on the feedbacks. The results are presented below.

🚧 **Coupler Conditioning: move to H112:** The move has started. The test cavity has been transported. Work on the PLC and software upgrades is under way.

4. Klystrons:

🚧 **SA2 Klystron:** Olivier visited Thales earlier this week. The klystron collector has suffered fatigue. Thales agree that tests should be done on the collector cooling arrangement. The cover will be rotated to see if the discoloration from overheating moves correspondingly. This should be detectable after only a few days running in H112. We are waiting on a report on water quality in SA2.

🚧 **Klystrons in UX45:** Should modification of the cooling arrangement around the collector be indicated, the work would be done 4 klystrons at a time. It could probably be fitted easily into the future schedule, or even done before first beam. If not there may be an interest in limiting to 200 kW with 46 kV HV. This would be adequate for first beam, but would mean that additional periods of conditioning would be needed later on.

5. SR4 and Equipment

✚ **SR4 ventilation units:** Still waiting on news from TS-CV.

6. LLRF

✚ **SM18 tests: (Philippe & John)** Philippe outlined the very successful tests on the feedbacks done on the test cavity. See [Measurements Set 1](#) and [Measurements Set 2](#). Several days of stable running at 1 MV with $Q=60000$ and 40 kW RF allowed practically all the required tests to be done. Responses to step changes in the Q component of I and Q modulation, observed for different gains of the digital loop, gave the different response times expected and allowed the gain to be optimised. The gain could be changed through a wide range without stability problems. LF phase spectra showed noise, from 50, 100 and 300 Hz harmonics effectively damped by factors corresponding to the loop gain. At optimum gain the peak to peak total of 6-7 degrees was reduced by a factor 50. The spectrum showed an unexpected component around 20 Hz. While this was also well damped by the loop the source is to be investigated at a later stage. HF noise, range 5-100 kHz, appears increased, but this may be due to the analog demodulator used for the measurements. The switch and protection module was included in the loop, and set to avoid klystron saturation. The resulting improvements in both the transient response and in the overall response time for large amplitude steps were also very convincingly demonstrated.

A scatter plot of the digitised data (in the Tuner Front-End), averaged over 100 us and sampled at 10 ks/s, showed jitter on I and Q to be less than ± 1 LSB.

Tests of the full feedback system, including both analog and digital parts, the switch and protection function and set point control have therefore all been very successfully completed. With the equally successful tests already done on the tuning system and on the conditioning DDS prototypes the most important elements for the cavity controller loops have been validated. The Modulator/Polar loop will require some tests as soon as water is back in SM18. In the meantime series production and testing for a major part of the system is now getting fully under way.

7. AoB

✚ **Dates of future meetings:** Due to the RAT meetings at P4 for hardware commissioning, LHC RF meetings will be held on Thursday mornings.

Next Meeting: Thursday 29th March at 08:45 in the JBA room.

E. Ciapala, 26th March 2007.