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SPES - Specific Services for CMS

Minutes of the meeting nr 23 held on 23/01/2002

Presents: R.Principe, A.Herve, P.Giacomelli, N.Bangert, L.Isaksen, P.Baillon, D.Loveless, G.Faber, R.Schmidt, S.Fratianni, I.Crotty, A.Hormiere, O.Teller, A. Zschoppe, P.Ingenito, A. Gaddi, S. Bally, I.Wichrowska-Polok.

1. NITROGEN TRANSIENTS IN CMS INERTION SYSTEM (R.Schmidt, S.Fratianni).

Stefano has shown the layout of the nitrogen pipes. Tree main pipes of the diameter 50mm will be branched in US cavern. Two pipes will go to barrel and tree to each endcap (3+3). In central wheel we will have 3 pipes on the one side and tree on the other side. Stefano has described the goals of the GWG program. The main goal of this program is to give the complete view of the most important thermo-hydraulic phenomena in discharging fluid from tanks into long pipelines. The program has been checked on the pressure drops. For the verifications two straight lines of the different diameters have been taken. See annexes 1a and b.

In the second part of presentation Reiner has described the Pipetank and U4 programs.

2. TESTS OF THE COOLING SYSTEM FOR RPC AND DT (A.Zschoppe).

Andreas has described the tests of the RPC and DT's which have been done in ILK (Dresden). Two sectors were tested, tubes were made from glass. The tap water has been used in the tests. Andreas has shown the animation of the filling, purging and deaerating of the circuit.

Investigation of the reliability of flow limiter has been done. Tree flow limiters were tested. Working function has been presented. There was mass flow variation during loading and unloading and in one case in presence of the dirt particles.

3. DEVELOPMENT OF THE ECAL COOLING PLANT (A.Hormiere).

Arnaud has made the status report of the ECAL cooling project. First he has described the technical requirements and cooling strategy inside ECAL. The principles and tasks of the existing module Mo have been explained. There are the temperature oscilation in power circuit due to a low quality regulation loop (self operated valve). This solution can not be used in the entire circuit of ECAL. A new design must be developed.

Arnaud has shown the proposal for the new design for regulating circuit. He proposed to use the double stage heat exchanger and to regulate the temperature lower than required 18°C and adjust with an immersion heater. More details about regulating circuit you find on:
http://hormiera.home.cern.ch/hormiera/pages/boulot/Page%20generale%20boulot.htm#Eregproposal
and in annexe3.
Arnaud has also made the immersion heater transient calculations which can be found on:
http://hormiera.home.cern.ch/hormiera/pages/boulot/ECAL/heater/Heaterbehaviour.htm
The power dissipated by a channel has been changed from 1.2 to 2.5 W/ch. The flow rate for the ECAL barrel is 10l/s for the power circuit and 50l/s for the regulating circuit.
The cooling station for a super module will be a test bench to set the hydraulic parameters and the regulation needs and possibilities for the final ECAL cooling circuit. More details on the page:
http://hormiera.home.cern.ch/hormiera/pages/boulot/ECAL/Prototype%20SM%20size/PrototypeSMsize.htm
We need to define the space which can be used by the cooling plant in H4 zone. There is an existing chilled water circuit, we have to prepare some minor pipes to heat exchangers. It has to be checked if the chilled water circuit gives enough flow rate, which is not a case now. The total cost of the cooling plant was calculated to about 200 kCHF (30 kCHF power circuit, 65 kCHF for regulating circuit, 15 kCHF for electrical material, 10 kCHF for H4 installation, 20 kCHF for the control and about 50 kCHF for the development and programming.

4. HEAT TRANSFER FROM ENDCAP RPC (I.Crotty).

Ian has done the calculations of the heat transfer from Endcap RPC. The heat dissipation is about 3W per board (1kW per station, per Endcap). There is also a heat production from the gas process 1W/m2 (1kW for entire Endcap RPC system). This heat is conducted into heat external circuit (cooling circuit segmented into 5,6 chambers) and could not be conducted to the chamber body, because it could cause the local run-away of the current in the HV. There will be also convection of the heat to FEB cover and radiation from the ASIC's and voltage regulators to aluminium faraday shield and to outside. The drawing of the board with localization of the ASIC's and Voltage Regulators has been shown.
For the calculations, sector 20° has been chosen, where the heat dissipation is about 20W, ΔT has been assumed as 0.5°, the calculated value of the mass flow rate was 28.7g/s. and velocity of the flow was 1.014 m/s. For the pipe of diameter 8mmx6mm, he calculated the Reynolds number 6082, Δp calculated over one sector circuit (L=34m) was 1.04 bar and Nusselt number 52.6, heat transfer coefficient was 5242 $W/m^2/K$ and Δt calculated from Newton's law of cooling was 0.15°C.
The pictures of Front End Board with cooper cooling pipes, the temperature map of the disk (assuming the heat transfer 4800W and cooling in the corners) and the pipe routing pictures have been shown. (see annexe 4)
The next step will be to continue the numerical study, to finish pipe routing and to mock-up assembly and to check the heat flows.

5. AOB

The next meeting will take place 13th of February at **<u>10h00</u>**. in the conference room 54/2-035.