Minutes ITS engineering meeting 6 June 2002

Main points

Cooling outside the ITS; the ST/CV group needs further info for the de-ionised water system. Time to completion is estimated 6 month's after start task. Currently the most important point is to estimate the needed rack space for the cooling system.

Cooling sub-detectors; test of the SDD end ladder electronics where presented. The tests show that one can cool away all the produced heat, maintaining an acceptable temperature for the chips. The tests need to be repeated as it was assumed that the chips where unpackaged, which might not be true for the final version.
The other sub-detectors had no news regarding the cooling.

Cooling services; a course CFD simulation was made on the effect of the power dissipation in the services. The simulation shows that without further actions the temperature would become unacceptably high (>60^{o}C).

Corrosion; a test with Phynox is being prepared and expected to start before the end of June.

Services; assuming the cables are now more or less known the space on the muon plug is sufficient for the all services. It is now important that the sub-detector groups prepare a design off the patch panels, again to see if the fit within the available space. To reduce the heat production of the services the use of bus bars will be further studied.
A database is being prepared about the services, the sub- detector groups are requested to verify and update the current information with Pierre Luigi.

Third cone; the SPD would like to reserve space for spools with glass fibre on the pixel cone, this currently seems to fit with the design of the third cone, though needs to be verified.

Alignment; most important is the need of an absolute measurement system for the alignment of the beam pipe. This measurement system is needed for the installation and beam pipe position monitoring. A further monitoring system is needed to measure the relative position between the central beam pipe and the muon arm beam pipe.

Beam pipe; the second support points will be fixed to the SDD cone, this would allow fore an other design of the FMD support for the RB24 side. A third support point is needed in front of the FMD. This support needs to be attached to the TPC, to ensure the beam pipe moves with the ITS & TPC. The third support point is of main concern as this support point in its current design forces the beam pipe to deform during the installation.
Urgent input is needed from the beam pipe group on the design of the first support point, as this also puts restrictions on the space available for the services of the SPD.

Details of discussion

Cooling Outside the ITS;
The requested segmentation was not clear for the ST/CV, the segmentation is

- Layer 6, 8 segments
- Layer 5, 8 segments
- Layer 4, 6 segments
- Layer 3, 7 segments

See also the cooling document.

For the detection of small leaks, a proposal was put forward. The proposal is to measure the weight of the fluid inside a buffer vessel. Force sensors would enable a resolution of about 1 mg. It was pointed out that temperature variations would cause a significant disturbance in the measurement.

The estimate for the time to completion of the cooling system outside the ITS is approximately 6 months. Therefore it is proposed to put the design work on the cooling system outside the ITS on hold till the end of 2003 / start 2004. Though it might be necessary to do some work regarding the design of the cooling system outside the ITS earlier, for example with respect to the control of this system. The design of the control would depend on how the control of the cooling system will be integrated in the total control of Alice. *On the short term an estimate of the needed rack space in the cave is needed.*

The technical coordinator requested to define a date for a TDR of the documents describing the requirements on the cooling system outside the ITS. Currently it seems that this document can be finalized somewhere in the first quarter of 2003, the TDR could then be in the start of the second quarter.

A requirements document needs to be prepared on the requirements on the airflow needed for the cooling of the detectors and the services. An important issue is the required reliability of the air supply system. Past experience gives rise to some concern, assuming one would not take some extra precautions.
The document needs to describe the needed airflow, the temperature of the air, the cleanliness of the air and the humidity of the air.

Cooling services; the main objective in looking to the heat dissipation from the surfaces is to determine the effects of the ITS, which are mainly determined by the heat dissipated by the services. To improve the understanding of the influence of the services the CFD model will be improved. The improved model should also take into account the airflows supplied to cool the pixel services in front of the cones, and the extra airflow coming from the SDD to remove the heat produced by the SDD and SSD services. The heat production in front of the cones is approximately 150 Watt. The main concern is the hotspot the exhaust from in front of the cones might produce at the connection of the TPC carbon barrel with the AL cones.
The services along the muon plug also produce approximately 150 Watt. It seems difficult to realise a temperature stability of approximately 1 K without a high-speed airflow or a large surface area for heat exchange.

Also the influence of the muon plug requires further study. Heat conducted true the muon plug can have a serious influence on the heat balance.
In the improved CFD model the outlet lines from the cooling of the SSD and SDD will be used to remove the heat from the services, the surface area of the pipes will the extended like fins on the pipe, to calculate the needed surface area to ensure a zero heat balance. For the calculations it is assumed that the speed of the air along the muon plug is approximately 0.2 m/s.