Minutes ITS engineering meeting 3 December 2001

Summary

- **Connectors** Each group should provide a proposal for the electric connectors
- **Services** Space requirements of the power connections has been show
- **Status cooling sub detectors**
    - SPD no news
    - SDD several tests have been done, for details see following.
    - SSD no news
- **CFD simulations** Focus on 2d model, for the prediction of the influence of the ITS on the TPC
- **Cooling outside ITS** Schedule and needs for information from the side of the ST/CV group will be discussed at the next meeting
- **Leak tests** A quantitative definition of the problem is needed.
- **Schedule cooling** A framework is available and needs to be completed by the next meeting.
- **Corrosion** Current quotations are doubtful with respect to the sought answers.
- **Cones** Update of the drawing of the cones, pixel cone and third cone will be made.
- **Beam pipe** First bellow moves at least 20 mm to the muon plug, forces of beam pipe on ITS will be calculated, the requirements of the beam pipe support have to be defined as well as the responsibilities for the design.
- **Space envelope ITS / FMD** Updated info on the cones and the services is needed. The temporary support cone is in the position of the V0.
- **Alignment** The requirements have to be redefined.

As there is a problem with the space available for the patch panel on the muon-plug the connectors and services should be given due attention.

Main points

Connectors: The sub-detector groups are requested to come with a proposal for the connectors. This mainly concerns electric connections. For the fluid lines and optical fibre a common solution for all the sub-detector group are being looked into.
For the fluid line connections there is a proposal from Beppe Giraudo and we are hoping we can use the connectors being developed for ATLAS. Prototypes of the connectors being developed for ATLAS are expected by February.
For the optical fibre connections, the connectors used by CMS are viable for the SPD, the SPD group is looking for alternatives.
The proposals should be send to Pier Luigi Barberis, he and a CERN expert will look for common factors and try to advice for possible improvements.

Services: The boundaries for the services on the muon-plug patch panel are now clearly defined, the total space available at the circumference is 2084mm, which is divided in 4 sectors. The available height is 78mm.
Based on the current knowledge the sub -detector groups require the following space for the power supply:

SPD	1000mm
SDD	240mm
SSD	200mm
Total	1440mm

Currently the SPD requires a disproportional part of the available space, this is due to the size of the electronic components required.
The services now not considered are:

- Signal cables SSD
- Optical fibres SDD and SPD
- Cooling lines / connectors
- Services FMD
- Services T0
- Services V0
- Alignment monitoring

The current estimate is that for these services at least a similar amount of space is required as for the power lines. The space on the muon-plug would not suffice.
The current alternative is stacking within the given height (78mm). The possibilities for stacking are limited by the height of the connectors and patch panels. Stacking was not considered with this first study.

Status cooling sub detectors

- SPD, no new developments
- SDD
  - A test of the end-ladder-electronics was conducted. In case of zero heat-exchange with the environment the maximum component temperature is about 6^{o} C above the temperature aimed for, assuming the current power requirements. Further tests with the final components will be conducted.
  - The hydraulic test of the cooling circuits on the mock up where completed. The measurements give the pressure drop as function of the flow over a pipe.
  - Simulations of the effect of an airflow on the temperature gradient where shown. The simulations showed only a minor effect (tens of a degree K) on the temperature gradient, even for airflow with a speed of 5 m/s.
- SSD, no new developments

CFD simulations. The simulations are currently focussed on the 5^{th} layer. The approach fore the full 3d simulation of a ladder and all ladders in a cylinder is at the moment departed. Current simulations focus on a 2d model of a detector and the next step will be to look at a full circle of detectors. The main aim of the simulations now is to see what effects of the ITS on the TPC are to be expected.

Cooling outside the ITS Outside the meeting the representative of the CERN ST/CV group (Miguel Santos) showed their work as being done for ATLAS. For the next meeting their group will look at the available information. This to see if they have sufficient information to start work on the system. Also time scale will be presented at which they ST/CV group can work on the system.

Leak tests Several possibilities where discussed, though we are still far from a solution. Important is that the problem must be quantified, to better understand what kind of fluctuations have to be detected.

Schedule cooling A frame work for a schedule for the cooling was presented which will be completed by the sub-detector groups by the next ITS engineering meeting.

Corrosion There has been a discussion with a manufacturer of the pipes. The manufacture can deal with the requirements we put forward for the use of AISI 316. There is also experience with alternative materials like Hastel alloy C22, CuNi and alpha Ti. He proposed a different material based mainly on Co, as this material has superior corrosion resistance and is easier in use for the production of the pipes. There are currently two quotations of corrosion research companies available, though from the quotations there is serious doubt if the proposed research work would answer our questions regarding corrosion. A further quotation will be requested at a different company, where the aim is to decide on the quotations by half January.

Cones For the question of the space envelope and the space required for services on the cone an update will be made of the drawings of the ITS cones the pixel cone and the third cone.

Beam pipe For the support of beam pipe the responsibilities have to be defined. This though requires a better understanding of beam pipe representative of the installation. For this a visit of the installation mock up in Torino is planned.
To improve the background for the FMD, T0 and V0 the first bellow after the ITS will be moved at least 20mm in the direction of the muon-plug, limitations on further moving of the first bellow will be explained at the next ITS engineering meeting. Also the forces on the ITS due to displacement of the beam pipe will be calculated, assuming a total displacement of 10mm of the beam pipe with respect to the ITS. The requirements of the beam pipe for the beam pipe support have to be clarified.

Space envelope ITS / FMD The impact of the installation scenario was discussed. This showed that the current envisioned extra structure for the installation (temporary support cone) is in the same position as the V0. From the ITS side updated drawings on the cones are needed. From FMD, T0 and V0 more information about the services is needed.

Alignment The requirements for alignment of the ITS have to be redefined. Position monitoring with respect to the TPC is of lesser importance due to the fixed connection of the ITS with the TPC. Monitoring would be mainly focussed on the deformation of the ITS over long terms.