

LHCb Technical Board 25/01/2001

Agenda

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| 2. Beam pipe & Background | G.Corti |
| 3. Tracking | M. Merk |
| 4. Outer Tracker TDR | B. Koene |
| 5. AoB | |
| RICH recommendation for the Photon Detector | D. Websdale |
| Answers from the Cal. Group to the LHCC referee questions | J. Lefrançois |
| Choice of the architecture for the muon trigger | H. Dijkstra |
| Of the electronics workshop | J. Christiansen |

Participants: J. Christiansen, G. Corti, H. Dijkstra, R. Forty, J. Harvey, H.J. Hilke, G. v Holty, B.Koene, D. Lacarrere, J. Lefrançois, R. Lindner, C. Matteuzzi, M. Merk, T. Nakada, T. Ruf, B. Schmidt, O. Schneider, A.Schopper, O.Steinkamp, I. Videau, D. Websdale

Exused: W. Flegel

1. LHC Schedule: H.J. Hilke informed the TB about a joint machine-experiments meeting on the 24th of January, where the LHC schedule was discussed. At this meeting a new planning for complete sector test, much longer than the previously foreseen injection test, was presented. The LHCb management pointed out that this test would very seriously interfere with the LHCb installation and could not be accepted, as long as the date of July 2005 for completing the installation had to be kept. LHC also drew attention to the interference between the space demanded for the LHC cryogenic boxes and the LHCb muon system. Without the clearance requested for the muon system, chambers could not be retracted fully and maintenance would be extremely difficult if not impossible for the inner parts.

2. Beam pipe and background studies: G. Corti presented the latest results on beam pipe and background studies. Effects of beam pipe material (Al 2219, BE, Al/Be(40/60) Met 160) and of bellows and flanges (material, number and position) were studied separately. Al 2219, allowing bake-out at 200°C with good mechanical properties, contains <7%Cu and has <10% higher radiation length than pure aluminium. The suppression of some of the flanges and bellows is under discussion with the vacuum group. Any work at CERN on Be or Be/Al is excluded.

Main conclusions:

The change from Al to Al/Be reduces secondary particles in IT3 by a factor of 1.7, in OT3 by 1.3.

For the Al/Be beam pipe, the difference in occupancy with and without Al flanges is only about 10% for the OT stations.

Open questions: cost of Be and Be/Al pipes, feasibility of Al bellows, safety acceptance of Be/Al flanges; in situ welding of Al2219. It is clear that we must by all means try to avoid stainless steel flanges and bellows. Assuming Al bellows will become available in our dimensions and until the other issues are clarified, we keep as options:

BE and Be/Al pipe with Al bellows and Be/Al or Al flanges;
All-Al pipe.

3. Tracking studies : M. Merk informed the TB on the status of the ongoing optimisation studies for the Tracking System, in particular on the following issues: the beam pipe choice and IT size; the need for horizontal planes next to the RICHes; the need for T1; number and layout for magnet stations; number and layout of seeding stations versus and need for T11. All these issues are clearly very important in many respects and need more work. There will be a special meeting on the open questions related to the need for T11 in the afternoon and on the need for horizontal planes in the next LHCb week.

4. Outer Tracker TDR: B. Koene described the present design of the outer tracker module, as well as the station layout and electronics status. The straw material has been decided to be 40µm Kapton-C + 25 µm aluminium. The gas will be a mixture of Ar/CF₄/CO₂ (75/15/10), with minimum CF₄ content. The module material adds up to 0.9% X0 at present, but the aim is to reduce this to 0.6, which would result in 2.5% X0 for one station of four layers.

The two-sided read out (split anode) has still to be tested: in April 2001 a 3.3 m long module and in October a module with the maximum length of 7 m will be installed in the test beam.

Modules of station T7-T10 are defined, but for station T2-T6 the inner/outer tracker boundary has still to be agreed on and the exact layout of the tracker inside the magnet with a clearance of 10 cm is still unresolved.

As analogue front end, the ASD-BLR chip is frozen and the tracker group decided to use the HPTDC as fall-back solution as TDC, but the preferred solution would be the potentially cheaper OTIS chip. The aim is to demonstrate a working backup solution in 2001 and then concentrate on the OTIS based solution, so that the choice between both chips could be made late in 2002.

As a result of the unsolved problems, which are also related to the still evolving design of the beam pipe, the Outer Tracker group concluded that the submission date for the TDR in March 2001 is too early; a shift to September 2001 is requested. B. Koene showed that with this shift the module production will still fit into the LHCb planning, the last modules being ready in December 2004.

The TB agreed to shift the submission of the Outer Tracker TDR to September 2001.

5. AOB:

TDR submissions:

Muon: TDR will be submitted in May 2001. Early February 2001 the muon group will decide on the TDR contents.

Vertex: The vertex group intends to keep the TDR submission date of September 2001.

Inner Tracker: The IT group foresees a shift of the TDR submission. The exact delay has still to be evaluated; a revised planning will be given to the referees in March 2001.

RICH recommendation on Photodetector: D. Websdale informed the TB on the outcome of the RICH meeting held on 24th of January. The only option likely to achieve consensus is to proceed with the Pixel HPD and the MAPD as fall-back solution. The revised schedule has a double milestone set for October 2001: an HPD operating with the present chip and a new pixel chip operating at 40MHz in the lab. This recommendation should be finalized by January 29th. The RICH-external referee B. Jean-Marie agrees fully to the recommendation. He stresses the need for efficient local magnetic shielding.

The TB endorsed the recommendation from the RICH Group concerning the revised schedule.

Calorimeter group answers to the LHCC referees: J. Lefrancois presented the report from the calorimeter group to be presented to the LHCC referees. He summarised the steps towards the Engineering Design Reports (EDR) for the support and frames in July 2002 and for the integration in January 2001. EDRs for the module construction of ECAL and HCAL are not foreseen, as the technology is based on previous designs and well understood. Concerning electronic tests, the Calorimeter group will perform tests of the final version of the ECAL/HCAL 32-channel ADC card with the prototype readout card and crate in the laboratory mid 2002. Tests in the test beam of the very-front-end cards of the PS and SPD are planned for 2001 and 2002. The final version of the PS-SPD front-end card together with the PS and SPD very-front-end cards will take place in the laboratory. Taking into account the early module installation in the pit, the late availability of the final DAQ and the limited resources, it is not foreseen to have a combined test of the calorimeters with final readout in the test beam.

L0 muon trigger, final choice on the architecture: H. Dijkstra reminded the TB that December 2000 was the milestone for the muon trigger group to choose the final L0 architecture. The trigger group studied the baseline solution as well as an architecture that is fully synchronous and pipelined. It is intended to come with a recommendation to the TB in February.

LHCb electronics workshop: J. Christiansen summarised the LHCb electronics workshop between the 16th and 19th of January. In particular, a recommendation has been worked out for the L1 front-end parameters (except L1 trigger rate) and the three ECS interfaces. Jorgen requested a discussion of these recommendations and if possible approval at the TB in February 2001.