

LHCb Technical Board 27 & 29 May 2002

Agenda

1. Approval of last TB summary.
2. LHCb-Light: Summary of status/ planning (T.Nakada) and discussion.
3. Milestones/Schedule for construction and commissioning (H.J.Hilke)
4. Comments on 2. WG on LHC Experiment-Machine Parameter and Signal Exchange (A.Smith).
5. LHCb policy on radiation hardness for electronics (J. Christiansen).
6. EDR for Pre-shower (J.Lefrançois, A.Schopper).
7. EDR for RICH2 'Mechanics' (D.Websdale, O.Ullaland).
8. HPDs: Status and next steps (D.Websdale).
9. AoB: - Test beams in 05/06
- **LHCb Coordinate System and Layout**

Participants: G. Carboni, J. Christiansen, H. Dijkstra, W. Flegel, J. Harvey, H.J. Hilke, D. Lacarrere, J. Lefrançois, R. Lindner, M. Merk, T. Nakada, C. Padilla, T. Ruf, B. Schmidt, O. Schneider, A. Schopper, A. Smith, O. Steinkamp, O. Ullaland (for point 7), D. Websdale, W. Witzeling

1. The **summary** of the last Technical Board was **approved**.

2. LHCb – Light

In the first TB session T. Nakada gave a brief summary of the status of the recent CERN meetings and the aims for this week and up to the TDR. In the second meeting, the TB discussed the information presented on Tuesday and the future steps.

The TB **approved the baseline layout** with an **all-Silicon TT1**, provided that the technical and manpower problems can be solved.

Baseline layout :

- **VELO:** 21 stations with Si-detectors of 220 μ m, RF-foil 200 μ m thick (before forming);
- **RICH 1:** Vertical layout with composite mirrors and light supports;
- **Magnet:** Magnetic shielding plates suppressed, to obtain a reasonable magnetic field inside the tracking volume (RICH 1 to TT1)
- **TT1:** All-silicon; 2x 2 layers (xu + vx), some 30 cm apart (if this can be accommodated in the 25mrad cone of the beam pipe)
- **Beam pipe:** 25mrad cone in Be, if possible providing extra length for RICH 1 and TT1.[After the TB it has been verified that we may indeed assume for the baseline this cone to be extended to z = 2700 mm (end of its flange)]. The 10mrad cone is assumed to be in Al/Be.

- **Tracking stations:** 3 equally spaced stations. [After the TB it was agreed that these stations should have equal height].

The TB agreed on the next steps towards the TDR:

- 1.) Freezing detector parameters: in a special LHCb-Light meeting June 24th.
- 2.) Start of M.C. production: Mid-July 2002.
- 3.) A full day during the Cambridge week to present and discuss the progress of simulation and designs;
- 4.) A special workshop on simulation results in mid-October 2002.

The TB agreed to the submission of the TDR for the **IT/ST1-3** for the November LHCC, containing details only on ST1-3 and brief comments on the separate TDR for TT1 (possibly forming a section in the LHCb-Light TDR).

3. Milestones/ Schedule

H. J. Hilke suggested for the future a clearer distinction between **MILESTONES** and **SCHEDULE**: **MILESTONES** are defined as safe dates, which could be 'promised' to the referees/LHCC but which are of course still compatible with the LHC planning; they should avoid unnecessary questioning by the Committees and others in cases where a delay is experienced, which is not critical at all. **SCHEDULE** is defined as our internal work plan, according to which the subsystems will try to proceed; this plan should be aggressive, to build up some reserve for bad surprises but must still look feasible. The gap between the milestones and schedule could vary significantly for different parts; in general one would expect a smaller gap for items which are already well in hand.

The following overall **MILESTONES** are proposed:

- Start installation of detectors and DAQ: July 2005
(Our Schedule should allow to start already up to one year earlier. On the other hand, some activities can not be stretched over too long a period for reasons of cost and continuity: e.g. overall cabling and piping require hired manpower, which should not change in the course of our installation.
- Finish installation and separate commissioning of all subsystems: 30.9.2006.
- Start simultaneous commissioning of ≥ 2 subsystems: 1.10.2006;

This assumes the first beam for 1.4.07 and access to the experiment until this date. If the 'injection test' would really be kept, some adjustments may be required as function of its starting date and duration, which both would strongly influence the degree of disturbance to LHCb installation and commissioning. Present LHC planning: start test April 2006, duration 1-2 weeks, to which installation and dismantling of provisional beam pipe may have to be added, if LHCb is not yet ready or wishing to install the final pipe. It is obvious that LHCb should strongly argue in favor of a suppression of this test, if necessary demanding a review by outside referees to judge the gain versus inconvenience for LHC and LHCb.

Other major interferences between various activities have to be well controlled:

- Magnet installation/ test wrt installation of cryoboxes and -lines (the latest LHC Schedule still keeps the previous dates for the start of these activities for our IP!);
- VELO-RICH1-TT-Beampipe;

- RICH2- beam pipe;
- M1- RICH2-Calorimeters.

The Coordinators/Project Leaders were requested to provide, wherever possible, their major Milestones during this LHCb week and the detailed Milestone list and updated Schedules by September. The CERN Management had already requested information on the updated Milestones: ATLAS and CMS has provided detailed lists and HJH has given global indications on how LHCb would adapt to the new LHC schedule.

4. Comments on Second WG on Signal Exchange.

(see <http://cern.ch/lhc-data-exchange>)

A. Smith summarized the main issues discussed.

- Beam pick-ups at 150m from IP are for timing only (not to check beam position). The **TB agreed** to follow a common solution for all 4 experiments, if cost and effort required are reasonable.
- The experiments will also receive treated signals from pick-ups located on the low-beta quads, which provide information on beam position.
- A. Smith will gather information on signals LHCb can provide.
- The **TB agrees** that LHCb should foresee a fast ‘beam-dump’ signal but possible disaster situations should be studied further before using it. The installation of special pick-up counters may be considered.
- LHC **start-up** is presently planned **with bunch spacing of 75 ns**. LHCb management is asked to communicate to CERN Management and LHCC a strong request to keep this 75ns operation period short.

5. LHCb Policy on Radiation Hardness for Electronics.

http://doc.cern.ch/archive/electronic/other/agenda/a02686/a02686s1t7/transparencies/radiation_policy.pdf

J. Christiansen summarized the problems and some suggestions (for more details see his presentation at the electronics meeting).

- The problem is complex and we need a **common approach** and good **exchange of data**, also with other experiments. Jorgen has started to put information on a **central Web location**.
- One major first step is the preparation of a table with updated estimates for **radiation loads** in areas where electronics is located. Lev Shekhtman is close to finishing this table. **TB agreed to include a safety factor of 2 in the table**.
- The **TB agreed to set as initial goals**:
 - For the electronics design, take an **overall safety factor of 10**, including qualification errors and production variations.
- With this safety factor, achieve as maximum rate for re-initialization necessary due to SEU:
 - 1/day for the experiment, i.e. 1/week for each subsystem;
- Achieve a maximum ‘major’ repair rate (‘major’ to be defined; dependent on location, effect on system, cost etc.):
 - 1/month for experiment, i.e. 1/year for each subsystem.

- We clearly need regular 'Radiation hardness reviews'.

6. EDR for Scint.Pad/ Pre-shower Detector.

The TB members had received the EDR, the answers to the referee (A. Eredidato) and the referee conclusions before the TB. A. Schopper briefly summarized some issues. The **TB approved the EDR**, with the proviso that the possibility of a design permitting the lateral opening into two halves should be investigated.

7. EDR for RICH2 Mechanics and Optics.

The TB members had received the EDR, the answers to the referees (M.Doets, M. Ferro-Luzzi) and the referee conclusions before the TB. After a few comments by D. Websdale, the **TB approved the EDR**.

8. HPDs

D. Websdale summarized the status and planning. The remaining problem is the deterioration of the bump bonding after the bake-out cycle required for the HPD production. To comply with the overall schedule, we need to find a solution by the end of this year. In order to keep the MaPMT as a viable back-up, design effort should be resumed \leq October this year, in particular on the front-end Beetle.

The HPD Review is planned for June 24th and meant to lead to a conclusion on how to proceed.

9. AoB

- Test Beams

H. J. Hilke summarized the latest information from the CERN Management.

- 2005: SPS closed; PS possibly also! (The LHCb management had at several occasions expressed its interest in the PS test beam. After the LHCb week, the PS closure appeared in Council documents)
- \geq 2006: West Area possibly closed. (This closure also appeared in Council documents).
- The TB requested the LHCb management to define its needs for test beams \geq 2006 and to inform the CERN Management, also about the cost and effort of a move of our West Area set-up to the North Area.

- LHCb Coordinate System / Layout

As this issue came up at several occasions during the LHCb week, we attach as a reminder a summary of the experimental zone and the LHCb coordinate system and layout. Note that it has been agreed that the axis of RICH1 will also coincide with the beam-line, as is the case for the VELO and Magnet.

LHCb COORDINATE SYSTEM AND LAYOUT

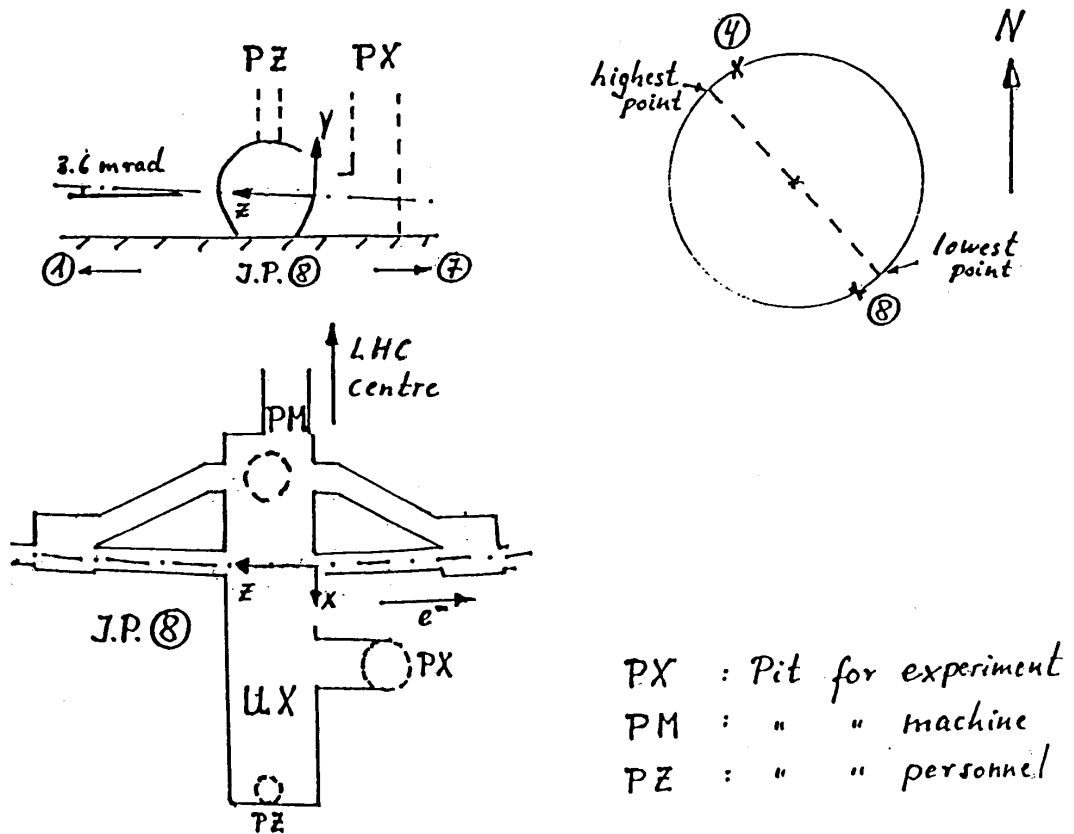
Origin (0,0,0) = Interaction Point, at 11.250 m from centre of UX;

x : Horizontal, pointing away from LHC centre;

y : Up, 'longitudinal' tilt wrt vertical ≈ 3.6 mrad (≈ 3.6030 mrad at $z=11.250$ m);

z : Along beamline, pointing from Vertex to Muon System;
tilt wrt horizontal plane ≈ 3.6 mrad.

The axis of the VELO, RICH1 and Magnet, as well as the centres of the other sub-systems, follow the beamline. The 'transversal tilt' of the beam plane (13.23 mrad) will not be followed. The UX floor is horizontal; the floor in the tunnel follows the 'longitudinal' tilt.



Subsystem Layout agreed:

VELO, RICH1 and Magnet: axis along beamline.

Other Subsystems: vertical, with centers on beamline.

All subsystems have horizontal symmetry axis (x)