Chapter 1

Overview **T.Nakada - 10 pages**

1.1 Physics

Motivation, goal and summary of the performance

1.2 Detector

Including front-end electronics

1.3 Data Handling

Trigger, DAQ, Control and Computing

Chapter 2

Detector D.M.Websdale - 45 pages

2.1 Machine Related items - G.von Holtey - 1 page

2.1.1 The LHCB interaction region

2.1.2 Requirements for IP8 optics

- shifted IP
- β (luminosity) tuning range
- spectrometer magnet and compensation

2.1.3 LHC aperture requirements

2.1.4 Beam pipe

2.2 Dipole Magnet - H.J.Hilke - 1 page

- design principles
- field integral
- precision of field map
- stray field
- run-up / run-down
- field inversion
- magnet specification (Table)

2.3 Microvertex - W.Ruckstuhl - 8 pages

2.3.1 Introduction

- purpose of detector
- principal performance requirements
- particle fluxes/operating conditions

2.3.2 Detector design/Technology

2.3.3 Vacuum tank

2.3.4 Front-End electronics

2.3.5 Alignment and Calibration

2.3.6 Performance

- simulation
- prototype tests

2.3.7 Future R&D programme

2.4 Main Tracking - W.Ruckstuhl - 10 pages

2.4.1 Introduction

- purpose of detector
- principal performance requirements
- particle fluxes/operating conditions

2.4.2 Inner detectors

- chamber configuration
- detector design/technology
- front-End electronics

2.4.3 Outer detectors

- chamber configuration
- detector design/technology
- front-end electronics

2.4.4 Performance

- simulation - track fit, pattern recognition, momentum and lifetime precision
- prototype tests

2.4.5 Alignment and Calibration

2.4.6 Future R&D programme

2.5 RICH - R.Forty - 10 pages

2.5.1 Introduction

Purpose of detector

Principal performance requirements

- momentum and angular acceptance
- B$\rightarrow \pi\pi$, kaon tagging

Particle fluxes/operating environment

- magnetic field
- radiation dose

2.5.2 Detector design/technology

RICH 1

- layout
- C_4F_{10} gas
- aerogel

RICH 2

- Layout
- CF_4 gas

Photodetectors

- Requirements
- Pixel HPD
  - silicon detector
  - envelope, focussing
  - prototype results
  - magnetic field sensitivity

- front-end electronics

- Pad HPD
  - silicon detector
  - envelope, focussing
  - photocathode deposition
  - prototype results
  - magnetic field sensitivity
  - front-end electronics

Mirrors

RICH construction

Calibrations

- Refractive index
- Alignment

2.5.3 Performance

Simulation

- Description
- Reconstruction of θ_C
- Precision
  - emission point, chromatic, pixel, tracking precision, momentum error
- Backgrounds
- Pattern recognition
  - likelihood definition
  - local analysis
  - global analysis
- Particle ID performance

Prototype tests

- Aerogel test-beam results
- RICH prototype description
  - 61-pixel HPD's
  - read-out scheme
  - beam telescope
  - aerogel studies
  - C_4F_{10} studies
  - resolution measurement

2.5.4 Future R&D programme

- Simulation studies
- HPD's
- Further RICH prototyping

2.6 Calorimeter - G.Carboni - 10 pages

No reply from GC yet - proposed skeleton follows

2.6.1 ECAL

Introduction

- purpose of detector
- principal performance requirements
- particle fluxes / operating environment

Detector design/technology

- pre-shower
- calorimeter

2.6.2 HCAL

Introduction

- purpose of detector
- principal performance requirements
- particle fluxes / operating environment

Detector design/technology

2.6.3 Front-End electronics

2.6.4 Calibration

2.6.5 Performance

- simulation
- prototype tests

Future R&D programme

2.7 Muon System - B.Cox - 5 pages

2.7.1 Introduction

Design criteria and strategies

- Muon trigger
- Particle ID
- Angular coverage
- Pad configuration
- Charged particle and neutron fluxes/operating environment

2.7.2 Overall Layout

- Layout of detectors
- Muon shield
  - composition, thickness, size, weight
  - movement capability
  - beam-pipe access

2.7.3 Detector design/Technology

Multigap RPC's

- Prototype test results
  - maximum rates
  - single bucket capability
- Requirements, channel numbers, sizes, etc

Cathode-Pad chambers

- Prototype test results
  - maximum rates
  - single bucket capability
- Requirements, channel numbers, sizes, etc

2.7.4 Front-End electronics

2.7.5 Alignment

2.7.6 Performance

- Summary of trigger performance -*details in trigger section*
- Particle ID

2.7.7 Future R&D programme

- Objectives
- Prototypes
- Beam tests

Chapter 3

Data Handling J.Harvey

3.1 Overview

- Trigger strategy overview
- Baseline architecture
- Definition of subsystem

3.2 Trigger - U.Straumann and S.Conetti - 15 pages

3.2.1 Level 0

- muon - performance and implementation
- calorimeters (e+h) - performance and implementation
- pile-up veto
- global trigger unit - combination and distribution of trigger

3.2.2 Level 1

- vertex trigger - performance and implementation
- track trigger

3.2.3 Level 2 and 3

- algorithms
- benchmarks

3.3 Data Acquisition - F.Harris and B.Jost - 7 pages

3.3.1 Requirements and design criteria

Data-flow model

- from detector to storage
- define scope of DAQ

Requirements

- performance (rates, data size, CPU and memory needs etc.)
- operational (partitioning, central console, control / monitoring)
- implementation (modularity, scaleability, data-driven software etc.)
- error handling (detection, reporting, recovery)

Design criteria

- minimise diversity - use common components
- use of commercial components
- flow standards

Comparison with other LHC experiments

- same rate, only 10% event size
- compare range of choices available - for protocols and implementations

3.3.2 Architectural studies

Baseline data-flow model

Event building protocol studies

- flow control (push/pull)
- segmentation of readout buffers
- simulation results

Baseline option

push all data to Event filter farm after Level 1

Fall-back solution

Phased event building a la ATLAS/CMS

Comparison of options

consequence for data-flow requirements and simplicity of implementation

3.3.3 Functional spec of readout elements

TTC

Front-end electronics

Readout multiplexing

Interface to Readout network

Readout network

Interface to event filter farm

Event processing unit

Data storage

Control and monitoring

3.3.4 Implementation Scenario

Readout crates

link transceivers, bus, controllers

Readout network

ATM, CSI, Gbit ethernet

Network interfaces

Links

Cost estimates

Common developments and studies in other experiments

3.4 Computing - J.Harvey- 3 pages

3.4.1 Computing model

- data-flow model: definition of data sets and processing stages
- strategy on calibration, simulation, reconstruction, event viewing, analysis
- volumes of data produced at each stage
- CPU needs in Level-3, reconstruction, simulation, analysis
- storage, distribution and management of data between CERN and institutes

3.4.2 Software requirements

- size of software in M-lines
- manpower needs in man years
- support for collaborative computing
- control of software quality

3.4.3 Approach to software development

- strategy for organising software development in project
- importance of architectural framework
- use of re-usable components: packages, databases, frameworks
- specific real-time and distributes processing issues: data driven

3.4.4 Software development issues

- new technologies: OO paradigm
- software engineering - software process and software development environment
- information systems: WWW, video-conferencing, database
- use of commercial software (CASE, Objectivity, etc.)
- common projects (GEANT4, LHC++, RD45, SDE, etc.)
- phases: current and future software, planing transition between phases

Chapter 4

Experimental Area H.J.Hilke 8 pages

4.1 Experimental Cavern

4.2 Services

4.2.1 Electrical power

4.2.2 Cooling and ventilation

4.2.3 Cryogenics

4.2.4 Surface buildings

4.3 Installation

4.4 Safety

4.4.1 Radiation environment

During LHC operation

(normal levels, accidental rates)

During shutdowns

4.4.2 Fluids

Chapter 5

Physics Performance T.Nakada 21 pages

5.1 Detector simulation - A.Tsaregorodtsev - 2 pages

5.2 Summary of trigger performance - P.Scheleper - 1 page

5.3 Studies of CP Violation and $\mathrm{B_s}$ Oscillations - 13 pages

5.3.1 Normalisation of B and $\overline{\mathrm{B}}$ - T.Ruf - 1 page

5.3.2 Flavour tag - C.Shepherd - 2 pages

5.3.3 Reconstruction of final states - 5 pages

- $\mathrm{B_d} \to \pi^+\pi^-, \mathrm{K}^\pm\pi^\mp$ - G.Wilkinson - 2 pages
- $\mathrm{B_d} \to \mathrm{J/psiK_S}, \mathrm{J/psiK^{*0}}, \mathrm{B^\pm J/\psi K^\pm B_s} \to \mathrm{J}/\psi\phi$ - J.Sabolido, Santiago-group - 1 page
- $\mathrm{B_s} \to \mathrm{D_s^-}\pi^+, \mathrm{D_s^-K^+}$ - NIKHEF-group - 1 page
- $\mathrm{B_d} \to \mathrm{DK^{*0}}, \mathrm{B^+} \to \mathrm{DK^+}$ - B.Cox - 1 page

5.3.4 Systematic - 1 page

5.3.5 Experimental sensitivities - 4 pages

- x_s - NIKHEF-group and O.Schneider - 1 page
- β - 1 page
- α - 1/2 page

- $\gamma, \delta\gamma, \gamma'$ - NIKHEF-group and B.Cox - 1 page
- Direct CP violation - 1/2 page

5.4 Other Physics

- Rare B-meson decay - 1 page
- $B_s \to \mu^+\mu^-$ - H.Dijkstra -
- $B_d \to K^{*0}\mu^+\mu^-$
- $B_s \to K^{*0}\gamma$ - I.Korolko -
- Rare tau decays - R.Mcnulty - 1 page
- $D\overline{D}$ oscillations and CP violation in D decays - T.Ruf - 1 page
- Search for light Higgs - T.Bowcock and A.Bay - 1 page
- Other things, top, SUSY etc.???? - 1 page

Chapter 6

Project Planning **H.J.Hilke 5 pages**

6.1 Organization

project organisation and team structure

6.2 Responsibilities

(table with by detector: institute, activity)

6.3 Schedule

(containing installation)

6.4 Cost

6.5 Resources

financial and manpower

6.6 Test beam

(infrastructure requirements)