CHAPTER 7

Integration with the Accelerator

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7.1 THE INTERACTION REGION

The interaction region of the ILD detector comprises the beampipe, the surrounding silicon detectors, the forward calorimeters with the masking system and the QD0 magent with its ancillaries and the support structure. The interaction region is shown in figure 7.1-1, figure 7.1-2 shows a blow-up of this region.

FIGURE 7.1-1. Interaction region of the ILD detector. The outer support structure of the magnets and forward calorimeters has been removed on the right side in this picture.

7.1.1 The Beampipe

7.1.1.1 Mechanics

7.1.1.2 Vacuum

7.1.1.3 Wakefield Losses

7.1.2 Masking and Forward Calorimeters

7.1.3 Support of the Final Focus Magnets

While the QF1 magnets of the final doublet will stay fixed in its position, the QD0 magnets need to move with the detector during push-pull operation. The magnets are installed in a support structure. Two solutions are under study for ILC. Figure 7.1-3 shows a solution with

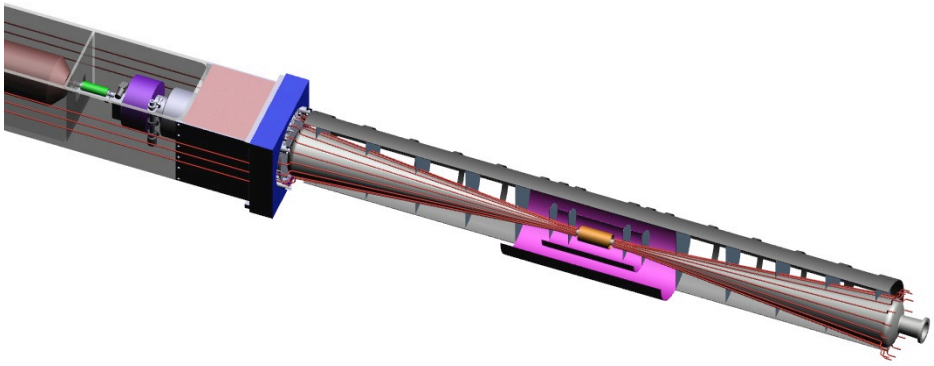

FIGURE 7.1-2. Interaction region of the ILD detector. Shown are the vertex detector (yellow), the SIT (pink), the ECAL plug (blue) with the LumiCal, the LHCAL (light red) and the BeamCal (violet). The routing of the cables is also shown.

a support tube with square cross section. The tube is made from 30mm thick stainless steel and is supported from a pillar outside of the detector and carbon fibre tension rods which are suspended from the solenoid cryostat. In this way the detector endcaps can be opened at the beam position without interfering with the magnet alignment. Another solution with a support tube with circular cross section is under study.

The QD0 magnets are placed in the support structure on actuators and are monitored using an interferometric laser alignment system like MONALISA.

7.2 MACHINE INDUCED BACKGROUNDS

Machine induced backgrounds have been studied in detail for the ILD detector and its predecessors GLD and LDC. The main relevant background are pairs from beamstrahlung which are produced in the highly charged environment of the beam-beam interaction. The background levels found are well below any critical limit. Table 7.2 summarises the expected background levels for several subdetectors for several beam parameter sets: the nominal ILC beam parameters for 500 and 1000 GeV cms energy and the Low-P parameter set[1]. Also shown are the detector specific tolerance levels.

7.3 PROVISIONS FOR THE LOW-P BEAM PARAMETERS

Necessary modifications:

Vertex detector inner layer shorter - or larger radius?

Beampipe modifications

Larger backgrounds in forward calorimeters

[1]The Low-P parameter set requires modifications to the baseline detector design which are described in section 7.3. The numbers in the table reflect these modifications for the Low-P case.

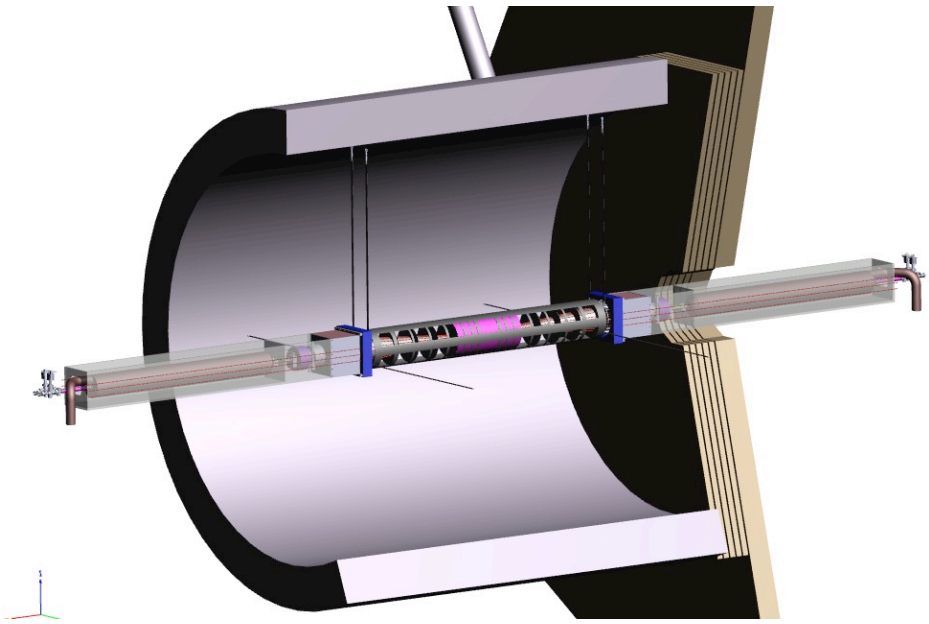

FIGURE 7.1-3. Support of the magnets in the detector. The support structure carries the QD0 magnets and the forward calorimeters. It is supported outside of the detector on a pillar and suspended inside from the solenoid cryostat using carbon fibre tie rods.

Subdetector	Nominal 500	Nominal 1000	Low-P	Tolerance
Vertex Detector				
SIT				
FTD				
TPC				
ECAL				
HCAL				

TABLE 7.2-1
Pair induced backgrounds in the subdetectors.

7.4 MEASUREMENT OF ENERGY AND POLARISATION

Traditionally the methods of measuring the beam energy and the beam polarisation are also parts of the Machine Detector Interface. As the polarimeters and the energy spectrometers are not a part of the detectors at the ILC but are common facilities in the machine, we will refer here only to the common design efforts [].