Chapter 2

Detector for the Linear Collider

General Detector Concepts and Detector Performance

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2.2.8 Infrastructure

2.2.8.1 Hall layout

The underground experimental hall must accommodate the detector and allow convenient installation and maintenance procedures for the whole lifetime of the experiment and for all foreseeable circumstances.

The experimental hall of rectangular cross section is divided by the beamline into a short and a long section. The long section of the hall will allow a complete detector installation or in a later phase upgrade of the detector with the installation area shielded by movable concrete blocks against radiation from accelerator operation. Commissioning of the linac is therefore completely independent of the detector status. The short section of the hall is designed to house one of the muon filter-shells with the detector in the interaction region and in the open position to access the inside areas of the barrel toroid.

The detector size and the various modes of operation (detector-assembly, detector-test in a parking position, detector-data taking in the interaction region) lead to the following approximate hall dimensions: width 30 m, length 82 m, beam height 9 m above floor, crane-hook 20 m above floor.

2.2.8.2 Detector assembly and Maintenance access to detector systems in the beam position

The detector consists of three independent parts moving on rails; a central part mounted around the beam pipe and two symmetric half shells which can be moved independently perpendicular to the beam line. The steel rails are installed in the floor of the hall and extend over the full length of the installation area and interaction region. The modular concept allows a simultaneous assembly of the various detector systems during the installation phase and a fast and easy access to detector components while the detector is in the interaction region. Two cranes are foreseen for the installation of heavy pieces.

The detector electronics is located in a 3 stories electronic trailer coupled to the detector and moving on the rail system. Figure 2.2.15 shows a cross section through the detector arrangement perpendicular to the beam.

The linac section between tunnel entrances and the detector – rolled into the beam position and closed for data taking – are shielded with movable concrete blocks. The detector is designed to be self-shielding. A layer of about 1 m concrete is mounted on the outer detector-shell to stop slow neutrons. Figure 2.2.16 is an isometric view of the closed detector with one detector quadrant cut out and part of the shielding removed to show the structure of the detector arrangement in the interaction region.

The detector design allows the outer shell of the detector to be split in two and moved apart leaving the central part in the beam position with the detector beam pipe permanently connected to the machine vacuum.

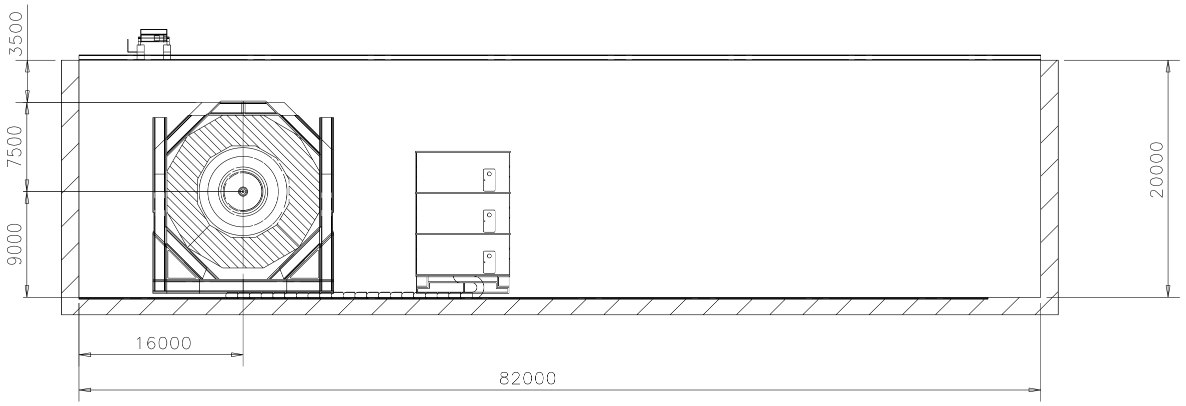

Figure 2.2.15: *Cross section through the detector arrangement perpendicular to the beam.*

To access the inner detector elements the calorimeter end cap discs are movable along the beam direction to storage positions on specially provided support frames. Figure 2.2.17 shows the detector with the calorimeter discs opened, Fig. 2.2.18 shows the detector arrangement during installation or maintenance work with the beam region shielded by concrete blocks.

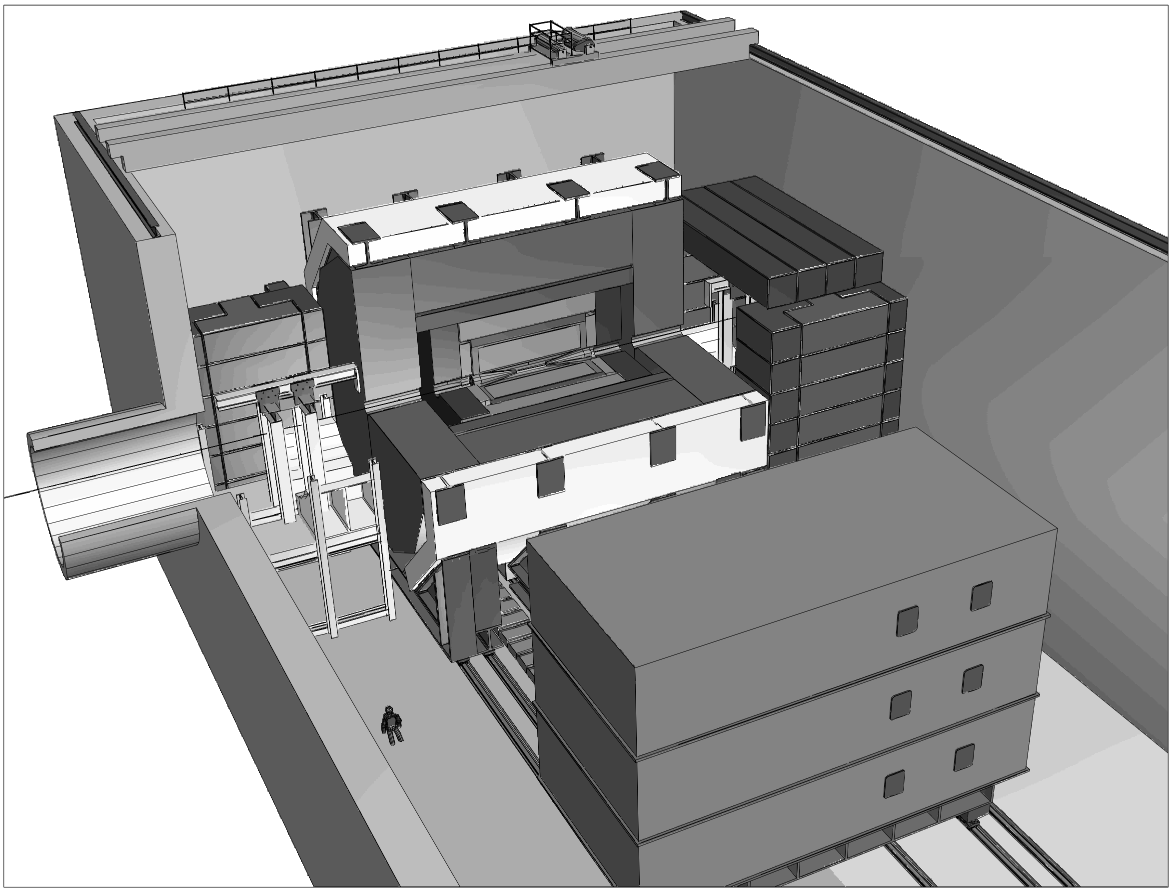

Figure 2.2.16: *Isometric view of the closed detector with one detector quadrant cut out and part of the shielding removed. For clarity the toroids are not shown.*

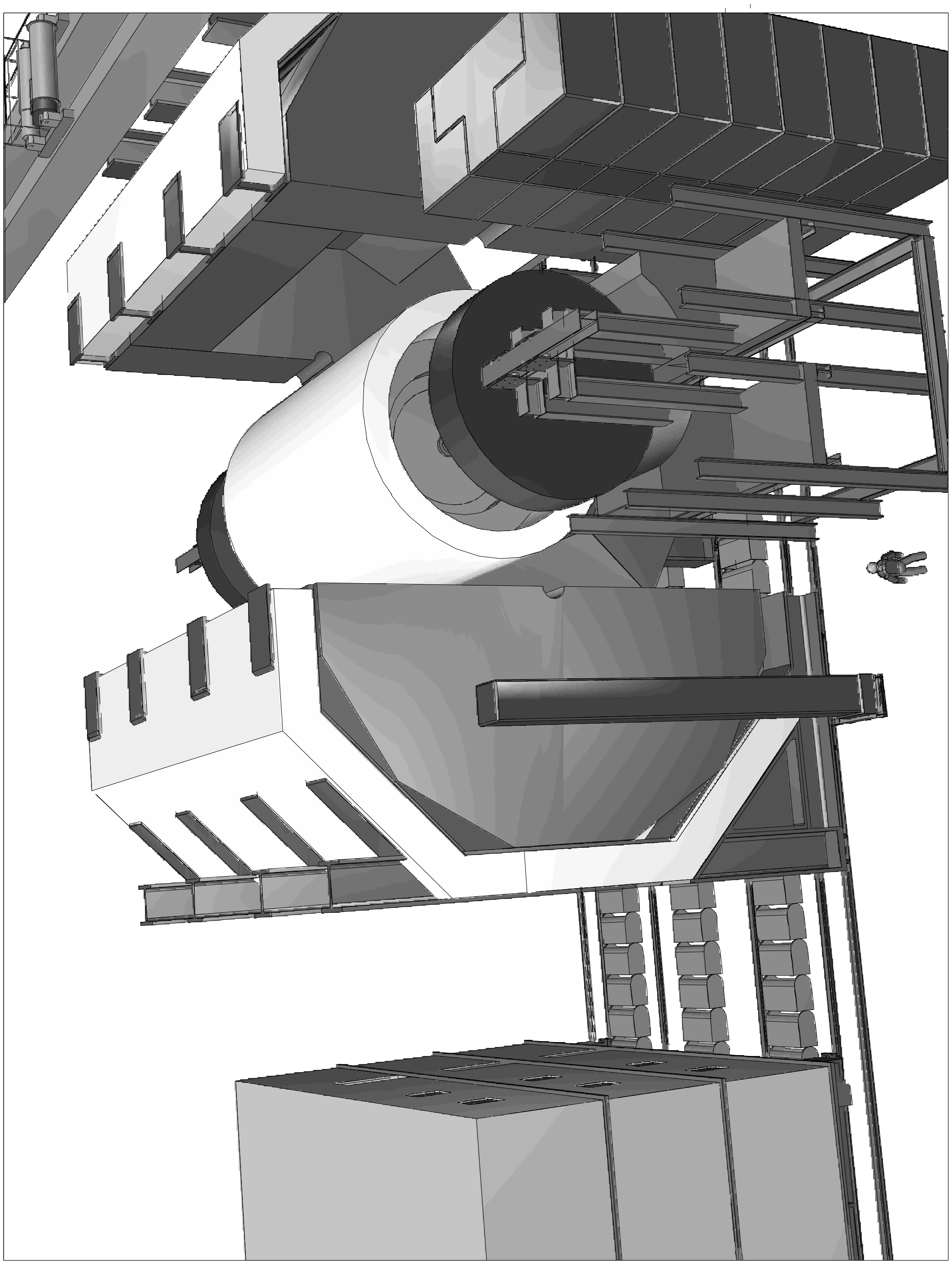

Figure 2.2.17: *Detector with the calorimeter discs opened.*

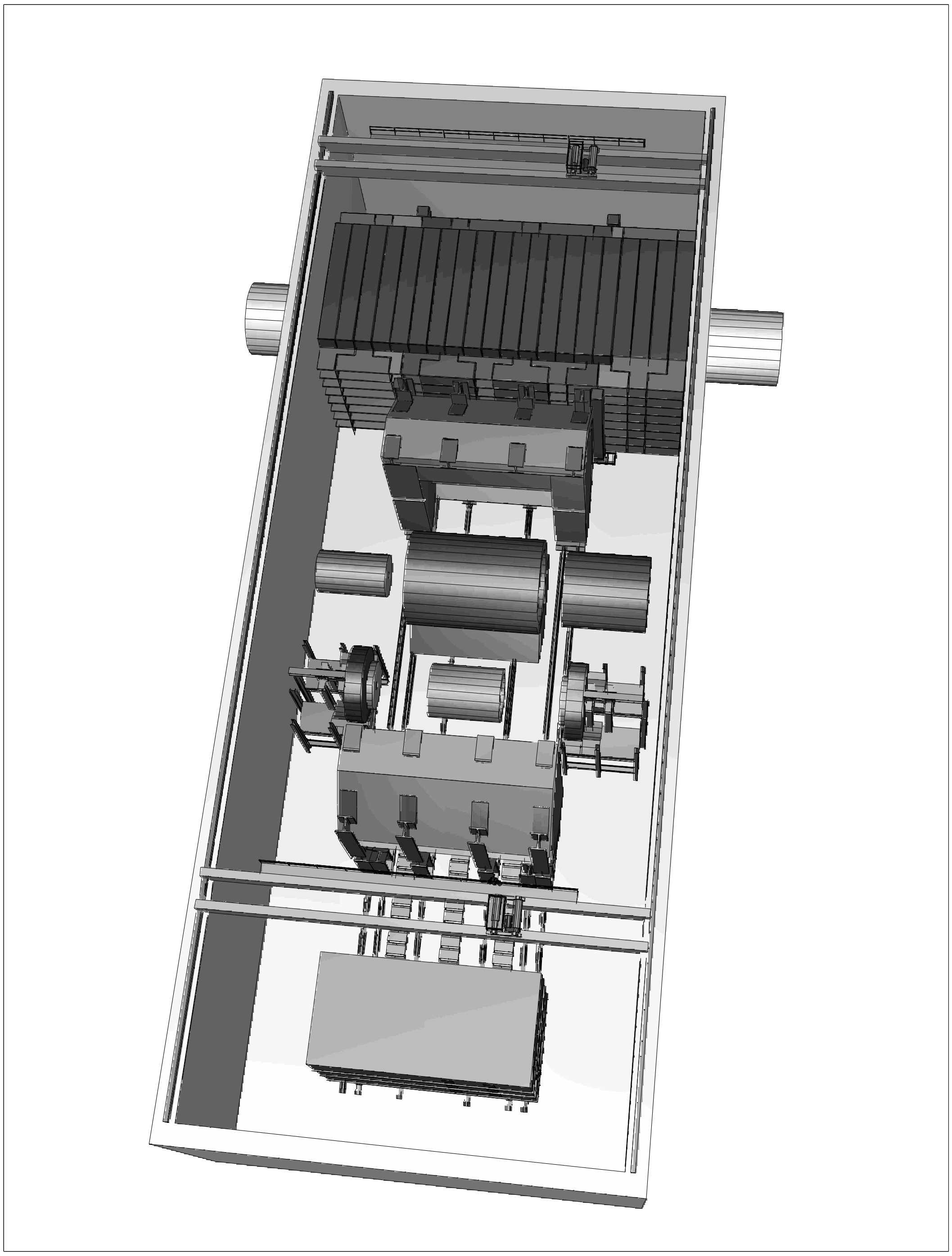

Figure 2.2.18: *Detector arrangement during installation with the beam region shielded by concrete blocks.*