A detector at a the International Linear Collider (ILC) will have a high-precision tracking system inside a calorimeter system, and both systems will have very high granularity. These will be contained in the detector solenoid which will produce the high magnetic field (4T) needed to reduce backgrounds at the vertex and to enable very good momentum resolution.
A typical design of a "large" detector is the Large Detector Concept (LDC ref1)) and the Global Large Detector (GLD, ref2), which have tracking systems consisting of a large TPC as the central tracker (ref3) combined with other detectors for vertexing, barrel and forward tracking. The current designs with a TPC are similar to an earlier design proposed in the TESLA Technical Design Report (ref4). Meanwhile the LDC and GLD concepts have decided to merge into one with the name Ilc Detector concept (ILD ref5).
A Time Projection Chamber (TPC) is a candidate for the central tracker because of its very good performance in past collider experiments. In order to obtain the order-of-magnitude improvement in momentum resolution and the highest possible track-recognition efficiency, the Linear Collider TPC (LCTPC, ref 6) groups (ref7) are pursuing R&D to find the best state-of-the-art technology for the TPC.
Three MPGD TPCs described in the ILC Reference Design Report (ref8) have the dimension of 2.8 - 4 m in diameter and 3 - 4.6 m in length. They are to provide 200 space points along a particle track with the $R\phi$ spatial resolution of 100 μm or better. The momentum resolution of $\delta(1/pt) \leq 0.5 \times 10^{-4} (GeV/c)^{-1}$ is envisaged in the magnetic field of 3-4 T.

To realize the excellent space resolution of 100 μm, a TPC with Micropattern Gaseous Detector (MPGD) readout instead of the Multiwire Proportional Chamber (MWPC) readout is needed. The MPGD under consideration are Gas Electron Multiplier (GEM, ref9) and Micromesh Gas detector (Micromegas, ref10).
Several relevant topics towards the ILC detector have been studied at small and medium sized TPC prototypes and will be pursued with a Large Prototype (LP) of a TPC. The LP will have a diameter of about 750 mm and a length of about 600 mm. This prototype will fit into a superconducting magnet (permanent current magnet, PCMAG) that has been installed in a test beam area at DESY in Hamburg. PCMAG will deliver a magnetic field up to 1.25 T. The test beam will consist of electrons with a momentum of up to 6 GeV/c and will allow to measure tracks with the LP of up to 50 space points.
The aim of these tests is not only to enhance the results obtained with smaller size TPC prototypes to a system on a large scale, but also to understand the issues which become visible when constructing such a large TPC.
Part of the LP is a field cage (FC), which is made out of composite materials.

The materials were chosen such that they guarantee a maximum of stability, though providing a minimum of material for the traversing particles. The homogeneous electrical drift for the ion and electron clouds in the TPC volume will be provided through a series of field strips, which have to be arranged such that the relative distortions of the field are below 10^{-4} within the drift volume. This can be achieved with mirror strips that lie on an intermediate potential.

Endplates were designed such that amplification modules can be mounted in a pattern that is a circular subsection of a possible TPC for the ILC. The endplates allow to position the modules to an accuracy of better than 50 μm.

Several different approaches for the amplification and readout modules will be investigated with the LP. These include amplification with GEM, Micromegas with standard signal pads as well as with CMOS pixel readout. Modules will also be equipped with gating devices in order to reduce the ion back flow into the sensitive volume. These techniques are described elsewhere in this conference.

Correction techniques for E- and B-field distortions have to be evaluated and the LP in connection with PCMAG offer a good opportunity to test these techniques since PCMAG does not have a return yoke, thus providing a field inhomogeneity.

Gas mixtures will be tested according to their performance, e.g. to provide a low diffusion, sufficient number of primary electrons and small electron attachment, sufficient large drift velocities of electrons and ions in acceptable fields and to test gating conditions in the case of GEM gating.

The LP will operate with a large number of channels that will read out the signals on either pads or CMOS pixels. This readout system is based on readout electronics that was developed for the ALICE experiment at the LHC: ALICE TPC Read Out (ALTRO). Starting with 125 ALTRO chips, which corresponds to 2000 channels, the chip will digitize the TPC signals with a sampling frequency of 40 MHz. The readout system will be extended by 1600 chips with 25 MHz sampling rate. In order to adopt this chip to the specifics of a MPGD based TPC, a new charge sensitive preamplifier has been developed (PCA16, ref..).

In order to have precise external reference points w.r.t. the tracks within a TPC, a set of highly accurate Si-strip modules will be deployed on the surface of the TPC. They will offer a position accuracy in $R\phi$ of ~12μm and along the axis of the TPC with ~20μm. A cosmic muon hodoscope will be installed around the TPC in order to cross-check the obtained results with other particles than the beam particles. Furthermore, a laser system will be implemented which allows to produce well defined tracks in the TPC.

The preparations for the LP setup are ongoing. It is expected to have a fully working system by the end of 2008.