

A Large TPC Prototype for an ILC Detector

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A Time Projection Chamber (TPC) is a candidate for the central tracker of the future International Linear Collider (ILC) detectors. TPCs have already demonstrated very good performance in past collider experiments. However the tracking system of the ILC should have a very good track momentum resolution ($\Delta(1/p_T) \sim 5 \cdot 10^{-5} / \text{GeV}/c$), which is an order of magnitude more precise than in previous experiments. To achieve this resolution, the Linear Collider TPC (LCTPC) groups are pursuing R&D activities to determine the best state-of-the-art technology for the TPC using Micro Pattern Gas Detectors (MPGD) readout instead of the Multiwire Proportional Chamber (MWPC) readout.

The MPGDs under investigation are the Gas Electron Multiplier (GEM) and the Micromesh Gaseous (MICROMEGAS) detectors as well as a new concept combining a gas amplification on top of a CMOS pixel readout chip (TimePix). To study these technologies, a Large Prototype TPC (LPTPC) has been built, with a diameter of about 750 mm and a length of about 600 mm, which allows to measure tracks with up to 125 space points with pad readout. Since end of 2008, the LPTPC has been inserted into a 1.25 Tesla superconducting magnet, installed in a DESY test beam area. The LPTPC, alternatively equipped with the GEM or the MICROMEGAS readout, is exposed to an electron beam of up to 6 GeV. With both technologies the preliminary results look very promising. A first TimePix endplate module, consisting of 8 chips and a triple-GEM stack will be tested in June 2009 at the LPTPC.

The LPTPC is not only a testing bed for several readout techniques based on MPGDs it is also an opportunity to understand the issues which arise when constructing such a large TPC. In this presentation, we will report on the setup, the production and the commissioning of the LPTPC as well as the first results of the test beams with the different readout technologies.

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