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Studies of Micro Pattern Gas Detector modules of a Large Prototype TPC for the ILC (12' + 3')

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Significant R&D on detectors for the future International Linear Collider (ILC) has been carried out during the last few years. The International Large Detector (ILD) is one detector concept at the ILC where calorimetry and tracking systems are combined. The tracking system consists of a Si vertex detector, forward tracking disks and a large volume Time Projection Chamber (TPC).

A TPC using novel micro pattern gas detector (MPGD) technology is being planned. Within the framework of the LCTPC collaboration, a Large Prototype (LP) TPC has been built as a demonstrator. Its endplate can accommodate up to seven modules of MPGD representative of the near-final proposed design for ILD. The MPGD technologies being developed for the LP are Gas Electron Multiplier, Micromegas and GridPix. All technologies have been studied with an electron beam in a 1 Tesla magnet at DESY. Successful test beam campaigns with several modules of MPGD readouts have been carried out in 2014 and 2015. Results regarding transverse and longitudinal spatial resolution will be presented with an emphasis on efficiency for reconstructing hits, measurement of the drift velocity, space point resolution, ion gate and control of field inhomogeneity. The future goals for the operation of a TPC at the ILC will also be summarized.

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