



Contribution ID: 52

Type: **Contributed Talk**

Development of a High Resolution TPC for the ILC

Thursday, 15 September 2005 09:30 (15 minutes)

A high resolution TPC with gas amplification based on micro pattern gas detectors is a promising candidate for the main tracker at the ILC detector. The physics goals and the expected environment at the ILC requires the development of a TPC with unprecedented performance.

Extensive R&D work has started to meet these challenges. We studied the process of ion backdrift and significant reduction was reached using special settings of the GEM structures. The influence of the space charge, produced by the remaining ions, on the track reconstruction has been investigated.

To further study the spatial resolution of a GEM-based TPC, a prototype with a low-mass field cage was constructed and operated within a high-resolution hodoscope based on silicon-strip detectors. Measurements of this prototype in high magnetic fields and in test beams are scheduled. Additionally, we spent extensive effort on the development of an accurate numerical simulation of the effects in our TPC, such as drift, diffusion and gas amplification.

The talk will give a status report of our R&D work and will address the questions which still have to be answered in order to meet the challenges of the ILC.

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Session Classification: S10 : New Gas-based Tracking Detectors

Track Classification: New Gas-based Tracking Detectors