TPC R&D for a ILC Detector by LCTPC group

(a) Magnetic field.

Non-uniformity of the magnetic field of the solenoid will be by design within the tolerance of $\int_{\ell_{\rm drift}} \frac{B_r}{B_z} dz < 2$mm as used for previous TPCs. This homogeneity is achieved by corrector windings at the ends of the solenoid. At the ILC, larger gradients will arise from the fields of the DID (Detector Integrated Dipole) or anti-DID, which are options for handling the beams inside the detector at the IRs with 14 mrad crossing-angle (as has been decided for the ILC). This issue was studied intensively at the 2005 Snowmass workshop[22][23], where it was concluded that the TPC performance will not be degraded if the B-field is mapped to 10^{-4} relative accuracy and the calibration procedures outlined in the next point (Sec. 3.8) are followed. These procedures will lead to an overall accuracy of 2×10^{-5} which has been shown to be sufficient[23] and was already achieved by the Aleph TPC[22]. Based on past experience, the field-mapping gear and methods should be able to accomplish the goal of 10^{-4} for the B-field. The B-field should also be monitored during running since the DID or other corrector windings may differ from the configurations mapped; for this purpose the option of a matrix of Hallplates and NMR probes mounted on the outer surface of the fieldcage is being studied.

Field uniformity of ∫Br/Bz<2mm will be achieved by corrector windings ?

B field mapping of 10^{-4} accuracy will guarantee the TPC performance ?

The non-uniformity can be allowed.