Experience with the ZEUS Central Tracking Detector

(title assigned)

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The Central Tracking Detector (CTD) of the ZEUS experiment has been in operation since 1992. It is a cylindrical drift chamber of length approximately 2 meters with a diameter of about 1m. The CTD has operated reliably in a magnetic field of 1.4T using a gas mixture of $Ar/CO_2/C_2H_6$ 90:8:2. Age related effects in the CTD are reported, with particular attention paid to the necessary addition of H_2O to the gas mixture during operation in 2000 to cure repeated trips of the high voltage.

Summary of Talk: The ZEUS Central Tracking Detector is a cylindrical drift chamber, built to a similar design as the CDF tracker. Its 4608 sense wires are arranged into 9 superlayers of eight wires each. Five of these superlayers have wires parallel to the chamber axis whilst the other four have small stereo angles (about 5 degrees). Originally developed for use in a 1.8T field with a Ar/C_2H_6 50:50 gas mixture, it has operated reliably from 1992 to the present in the ZEUS environment of 1.4T and a gas mixture of $Ar/CO_2/C_2H_6$ 90:8:2 bubbled through ethanol. The properties of this gas (Lorentz angle, drift velocity and gain) are similar to Ar/C_2H_6, but it offers safety against whisker growth and is quieter in operation. Until 1997 the CTD had shown no signs of aging. However, towards the end of that year there were several instances of non-beam induced trips of the high voltage (HV) that could only be cured by disconnecting the affected section of the chamber from HV for a number of days. This problem became more serious during the 2000 data-taking period and so, after a short study, the gas mixture was changed to add a small quantity of distilled water. This addition of water had some undesirable effects, notably large changes in the electron drift velocity and Lorentz angle, but to date has completely cured the problem of trips of the HV. The CO_2/C_2H_6 composition of the gas was subsequently adjusted to return the drift velocity and Lorentz angle to acceptable values. This change was motivated by use of the Garfield program to predict relative changes in the Lorentz angle due to variations in the gas composition.