Abstract

This document describes the design and construction of the new tracking drift chambers for the High Momentum Spectrometer (HMS). These chambers, which replace the original HMS chambers, are of the same style as the SHMS drift chambers except for a different active area.

1 Introduction

New drift chambers have been constructed and installed in the High Momentum Spectrometer (HMS). These chambers are modeled after the SHMS drift chambers. The HMS chambers have the same mechanical and electrical design as the SHMS chambers with the primary difference being the different active area of $100 \times 52$ cm$^2$. Details of the SHMS chambers can be found in the SHMS Drift Chamber Reference [1]. This document describes features that are unique to the HMS chambers or different from the SHMS chambers.

2 Mechanical Design

As with the SHMS drift chambers, each HMS drift chamber is assembled from three types of printed circuit boards, namely 2 X-planes (Figure 1), 4 U-planes (Figure 2) which can be U or V-planes depending on rotation, and 8 K-planes (Figure 3) that hold the cathode foils surrounding the wire planes.
Low voltage, threshold and ground rails are aluminum instead of copper and are mounted to the fiberglass midplane. (Figure 4) The rails are under the discriminator boards and their carrier cards so are largely shielded from hands and tools. The rails are covered with electrical tape where not otherwise covered by the cards. The +5 V and -5 V supplied to these rails is protected by 10 Amp fuses, with one pair of fuses per half chamber. These fuses are in electric boxes (Figure 5) as opposed to the SHMS where they are mounted on the fiberglass midplane. The low voltage is supplied by a single pair of Acopian 5V supplies (Figure 6) as show in the circuit diagram in Figure 7.

The HMS chambers use the same plane ordering as the SHMS chambers, namely (U, U’, X, X’, V’, V). The second chamber is identical to the first chamber, but is rotated 180° about the vertical axis, giving a plane ordering of (V, V’, X’, X, U’, U). Note that because of this rotation, the U planes in the second chamber are parallel to the V planes in the first chamber and the V planes in the second chamber are parallel to the U planes in the first chamber. A picture showing the two chambers mounted in their frame is presented in Figure 8.

References

Figure 1: Drawing of X-plane PCB.
Figure 2: Drawing of U-plane PCB.
Figure 3: Drawing of cathode (k-plane) PCB.
Figure 4: Aluminum low voltage distribution rails that supply +5 V, -5 V, threshold and ground to the amplifier/discriminator cards. These rails are mounted to the fiberglass midplane of the chamber.
Figure 5: 10 Amp fuses +5 V and -5 V. Each half chamber is separately protected by fuses.
Figure 6: Back side of Acopian power supplies showing connections to five conductor cable.
HMS DRIFT CHAMBER LOW VOLTAGE

NOTE: SINGLE CHAMBER RAIL SET SHOWN, (4) SETS PER CHAMBER

DC-2
-5V SUPPLY

ACOPLAN
+ -5V SUPPLY

GND

DC-1
POWER SUPPLY RACK
DISTRIBUTION BOX

ACOPLAN
-5V SUPPLY

GND

THRESHOLD VOLTAGE POWER SUPPLY
(REMOTELY CONTROLLED)

THRESHOLD VOLTAGE DISTRIBUTED TO ALL SIDES OF BOTH CHAMBERS WITHIN CHAMBER FRAME

12AWG (6) COND CABLE W/ AMPHENOL CONNECTOR AT RACK DISTRIBUTION BOX

TO CHAMBER FRAME DISTRIBUTION BOXES (1) PER CHAMBER

12AWG (3) COND CABLES TO CHAMBER (x4)

12AWG (6) COND CABLE FROM
POWER SUPPLY RACK

DISTRIBUTION BOX DETAIL (1) BOX PER CHAMBER

FUSE 10A
WHT +5V
BLK -5V
GRN GND

THRESHOLD VOLTAGE

ALUMINUM BARS
(4) SETS PER CHAMBER

Figure 7: Diagram of low voltage distribution.
Figure 8: HHMS drift chambers mounted in detector hut frame.