Chapter 5

Inner Detectors

5.1 Electronics

5.1.1 Testing, Alignment, and Calibration

The vertex position requirement in the z direction is 2 mm; in the plane transverse to the beam, the definition is the beam size ($\sigma_T \approx 0.45$ mm for Au + Au [4]). Some chip placement aberrations result in a track ending up in a strip neighboring the expected one, reducing the peak value of the correlation function between the two layers, which is the quantity used to locate the vertex when the so-called correlation method is used (for high-occupancy events). When the pseudo-tracking vertex finding method is employed (for low-occupancy events), chip placement aberrations also reduce the probability for finding the correct vertex.

A Monte Carlo study using Au-Au events was done to determine the maximum allowed Silicon panel placement aberration. The track finding efficiency was determined as a function of the panel z-placement and angular placement accuracy, as well as of humidity excursions. The latter could be done because humidity excursions result in known amounts of distortion of the MVD assembly.

The results are summarized in table 5.1.

The algorithms are not sensitive to displacements of the panels along a direction parallel to the Silicon strips. Of course some of the placement errors can be compensated for by the proper calibration procedures. However, we would like to preserve the option of running the

Table 5.1: Summary of tolerances in placement of Silicon panels.

efficiency loss	Si panel z-placement accuracy	Si panel angular placement accuracy	maximum humidity excursion
-5%	0.08 mm	0.21°	9%
-10%	0.16 mm	0.42°	18%

vertex finder in a processor close to the hardware (such as the DCM), where there may not be time or space to employ calibrations.

The mean beam position relative to the MVD may vary from fill to fill, and the entire central magnet, onto which the MVD is mounted, may shift relative to the beam by up to 1/8" when the magnet is rolled out and back into position again. In order to cope with these situations, the vertex finding algorithm is now a 2-pass method: on the first pass, the mean transverse position (x,y) is found from a small sample of events. If the vertex has a transverse displacement, the efficiency can be low, but the mean position can nontheless be accurately determined. On the second pass, the mean transverse position that was found in the first pass is used in the algorithm, and the vertices are now found with full efficiency. One implication of this is that there are no longer tight requirements on the global positioning of the MVD.

Calibration of the electronics chain is achieved by the injection of a known amount of charge into each preamplifier channel. Each channel can be individually enabled or disabled, allowing detailed testing and calibration of the entire electronics chain through the front-end electronics and data acquisition system.

5.1.2 Bias Supplies

Bibliography

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